An International Multidisciplinary e-Magazine
www.sabujeema.com
Volume 2 | Issue 11| November, 2022

SABUJEEMA

GOOD AGRICULTURAL PRACTICES FOR SUSTAINING THE PRODUCTIVITY AND PROFIT IN RICE-BASED CROPPING SYSTEM IN COASTAL ODISHA

B. S. Satapathy, S. Pradhan, S. K. Mishra & G. Acharya

"Read More, Grow More"

Sabujeema Sabujeema
editorsabujeema@gmail.com
sabujeema-international multidisciplinary-e-magazine

Volume 2 - Issue 11– November, 2022
SABUJEEMA
An International Multidisciplinary e-Magazine

GOOD AGRICULTURAL PRACTICES FOR SUSTAINING THE PRODUCTIVITY AND PROFIT IN RICE-BASED CROPPING SYSTEM IN COASTAL ODISHA

[Article ID: SIMM0208]

B. S. Satapathy
S. Pradhan
S. K. Mishra
ICAR-Indian Institute of Water Management, Bhubaneswar-751 023
G. Acharya
ICAR-Central Horticulture Experiment Station, Bhubaneswa-751 019

Rice-based production system is the back bone of the economics of coastal farmers of Odisha. Frequent floods, cyclone, salinity and periodical droughts are major yield decremental factors which influence the productivity and profitability of farming in coastal Odisha. Rice-green gram, rice-black gram, rice-vegetables, rice-green gram/black gram-vegetables are major cropping systems dominated in coastal ecosystem. Under the scenario of climate change, sustainability of existing rice-based farming are losing momentum due to decrease in factor productivity, reduced input use efficiency, increase in cost of production and high prone to risk due to climatic hazards. Appropriate choice of cropping systems, varieties, adoption of good agro-techniques, need based pest control and timely harvesting, processing and safe disposal of farm produce holds good to increase the profitability and employment in agriculture. Some of good agricultural practices for enhancing the farmer's income in coastal Odisha are described below.

(A) Good agricultural practices for kharif rice

(i)Rice varieties: Varieties suitable under different land type and rice ecosystem are listed in the Table 1.

Table 1: Rice varieties for coastal Odisha

Land type/Ecology	Recommended varieties
Rainfed medium land	Binadhan 11(120), Lalat (130), DRR 42 (120), DRR 44 (120), CR Dhan 205 (120), CR Dhan 207 (120)
Irrigated medium or lowland	Rajlaxmi (135), Ajaya (135), Maudamani (135), CR Dhan 800 (140), CR Dhan 314 (135), CR Dhan 312,
Rainfed shallow lowland	Pooja (150), CR Dhan 407 (150), CR Dhan 409 (160), CR Sugandha Dhan 908 (145), Hasanta (150), CR Dhan 401 (150)
Semi deep water	Varshadhan (160), Durga (155), Sarala (150), Gayatri (155), CR 1014 (155)
Deep water	CR Dhan 500 (160), CR Dhan 502 (160), CR Dhan 503 (160), CR Dhan 505 (162), CR Dhan 507 (160), CR Dhan 508 (160)

Saline soil	CR Dhan 406 (Luna Barial) (150), CR Dhan 402 (Luna Sampad) (140), CR Dhan 403 (Luna Suvarna) (150), Lunishree (145)
Flood prone ecosystem	Swrana sub 1 (140), CR 1009 sub 1 (155), Ranjit sub-1 (140), Binadhan 11

Note: The number mentioned under the parenthesis indicates the duration of the varieties

(ii) *Use of quality seed*: It is advocated to arrange certified or truthfully levelled seeds from reliable sources like government farms or registered seed agencies. Farmers can use their own saved farm seeds of high yielding varieties for 2- 3 years without deteriorating the quality and yield of rice.

(iii) *Seed treatment*: Seed bio-priming with *Trichoderma harzianum or Pseudomonas flourescens* 0.5% W.P. @ 10 g /kg of paddy seeds is helpful to keep the crop disease free at early stage of crop growth. Soak the paddy seeds in water for 8-10 hours, decant water, mix with bio-control agent and store as a heap covered with moist sack or polyethylene for 12-24 hours before sowing.

(iv) Optimum seed rate: The optimum seed rate for HYVs is 12-14 kg/acre and hybrids is 5-6kg/acre.

(v) Crop establishment with optimum plant population:

• Line transplanting of seedlings of 3–4-week age, 15-20 cm height, 4-5 leaves, 2-3 seedlings per hill with 20 cm × 15 cm in erect and shallow depth ensures optimum plant population per unit area. For hybrids use younger seedlings of 14-21 days, 1-2 seedlings per hill at 20 × 15 cm.

• As an alternate to line transplanting mechanical transplanting can be promoted for reducing the cost of production and increase in yield. Rice seeds are sown on a thin layer (1.5 - 2.0 cm) of soil and FYM or compost or vermicompost mixture (4:1) in a specifically designed frame or fields by using polythene sheets/ concrete floor/seedling trays. The mat raised on the frames is of the desired shape which fits well into the transplanter, however, the seedlings grown on polythene sheet in the field need to be cut into desired shapes and sizes to fit into the trays of the transplanter. Seedling raised in one cent is sufficient to transplant one acre. Seedlings are ready for planting within 14-20 days after seeding (DAS). The seedlings are transplanted in the well prepared (puddled) field using the rice transplanters at a spacing of 22.5-25.0 ×15 cm. Gap filling in missing hills is desirable to maintain the optimum population.

(vi) Nutrient management

▪ After primary land preparation broadcast quality *dhaincha* seeds @ 12kg/acre at 45 days before the final puddling. Incorporate the *dhaincha* plants in to the soil at the time of puddling.

▪ Apply well decomposed FYM or cow dung @ 2t/acre or vemicompost @ 0.5 t/acre as basal dose at the time of last land preparation.

▪ The blanket dose of fertiliser for different rice cultures as mentioned in Table 3.

Table 3: Fertilise dose and application schedule in different rice culture

Rice culture	Fertiliser Dose	Fertiliser application schedule
Rice nursery	40:20:20 Kg of N: P: K/acre	* Basal: 2.5: 5.0:5.0 g of N: P: K + 0.5 kg FYM/m^2 of nursery * Topdressing: 2.5 g/m^2 of N at14 DAS
Transplanted rice (HYV)	32:16:16 kg of N: P: K/acre	• Apply 25% nitrogen and all phosphate and potash fertilizer at the time of final puddling and incorporate the fertilizer thoroughly in the soil. • Apply 50% nitrogen at tillering stage (3 weeks after transplanting), rest 25% at 18 to 20 days before heading (panicle initiation stage). • In light textured soils, apply potash fertilizer in two equal splits at final puddling and panicle initiation stage.
Transplanted rice (hybrids)	48:24:24 kg of N: P: K/acre	• Apply 25% nitrogen and all phosphate and 3/4th of potash fertilizer at final puddling and incorporate the fertilizer thoroughly in the soil. • Apply 40% nitrogen at tillering stage (3 week after transplanting). • Apply 25% N and K at 18 to 20 days before heading (panicle initiation stage). • Apply rest 10% of N at flowering.

*Reduce the dose of N fertiliser by 25-50% in the transplanted rice where *dhaincha* is incorporated in to the puddled soil.

*In micronutrient deficient soil use 0.5 g m^{-2} Zn and 0.11 g m^{-2} B as basal dose in rice nursery.

▪ In case of rainfed rice apply top dressing of fertilizer when there is sufficient soil moisture in the field. Do not apply top dressing in flooded soil.

▪ Use neem coated urea to increase the nitrogen use efficiency

▪ Use LCC (Leaf Colour Chart) or Nitrogen expert App for deciding the time of nitrogen application as top dressing to increases the nitrogen use efficiency.

▪In zinc deficient areas apply once in two years Zinc Sulphate @ 10 kg/acre at the time of final land preparation (once in 2-year cycle). On appearance of deficiency symptom in the field spray 0.5% $ZnSO_4$ solution (2kg $ZnSO_4$ +10kg of lime in 400 litres of water in one acre) thrice at 15 days interval.

• In boron deficient soil apply borax @ 2-4 kg/ace at the time of final land preparation on soil testing. In case of appearance of boron deficiency in the field, spray borax or boric acid @ 0.05% for quick recovery

(vi) Integrated weed management

• Land levelling is important for proper water management and uniform crop stand establishment which helps to suppress the weeds.

▪ Always use well decomposed FYM/ Cow dung to minimize load on soil weed seed bank.

▪ Maintain the field bunds, drainage and irrigation channels and farm implements neat and clean.

• Manual weeding twice at 20 and 40 DAT is the most common practice in rice. But it is labour intensive, tedious, drudgery causing, expensive and no more economically competitive.

•In line transplanted rice mechanical weeding by finger weeder/ cono weeder/ paddy weeder/ power paddy weeder at 20 and 40 DAT can be practised as an alternate to conventional manual weeding which reduces the cost of production

• As an alternate to conventional manual/mechanical weeding rice herbicides can be successfully used for broad-spectrum weed control in rice. Use any one of the options as mentioned in Table 4.

Table 4 Herbicides to control weeds in rice

Rice culture	Herbicide
Rice nursery	*Pyrazosulfuron-ethyl (Sathi) @ 80g/acre at 1-3 DAS in 120 lit of water or, *Bispyribac-sodium (Nominee gold) @ 120 ml at 10-15 DAS (2-3 leaf stage of weeds) in 120 lit of water.
Transplanted rice	*Pretilachlor (Refit) @600ml/acre at 1-3 DAT, broadcast mixed with 4kg of sand in saturated soil or, *Bensulfuron-methyl + pretilachlor (Erase strong/ Londax power) @ 4kg/acre at 5-10 DAT, broadcast mixed with 4kg of sand in saturated soil or *Bispyribac-sodium @ 120 ml/acre at 10-15 DAT (2-3 leaf stage of weeds) in 120 lit of water or *Penoxsulam+ Cyhalofop-butyl (Vivaya) @ 900ml/acre at 15-20 DAT (3-4 leaf stage of weeds)

(vii) Need based integrated insect-pest and disease management

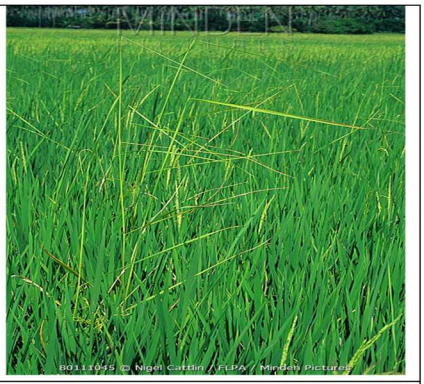
Preventive measures followed by need based integrated control measures are required to save the crop from insect-pest and diseases interference. Need based control measures for some major insect-pest and diseases are listed in Table 4.

Table 4: Need based insect-pest and disease control practices in rice

Insect-pest	Control measures	
Yellow Stem borer (ETL: 1-2 dead heart in vegetative stage or one egg mass or one moth/ sq. m in the heading stage  .	• Release egg parasitoid *Trichogramma japonicum*@ 40000 eggs /acre (3 cards /acre) for 3 times. •Fix light trap @1/acre to attract and kill adults of stem borer and leaf folder. •Instal 8 pheromone traps/ha in the rice field for monitoring of the yellow stem borer and leaf folder. Whenever the number of male moths /traps reaches 4 to 5 apply any one of the following control measures. • Apply azadirachtin 0.15% neem seed kernel-based EC formulation @ 800 ml/acre **or,** chlorantraniliprole 4% GR @ 4kg/ acre **or,** cartap hydrochloride 4G @ 10kg/acre may be applied mixing with sand at 1:1 ratio or spray chlorantraniliprole 18.5% SC @ 60 ml/acre **or,** flubendiamide 20 WG 50g/acre in 200 litres of water.	
Leaf folder (ETL: 2 folded leaves /hill)	•Spray chlorantraniliprole 18.5% SC @ 60 ml/acre, **or** flubendiamide 20 WG 50g/acre **or,** cartap50 WP@ 400 g/acre, **or** quinalphos 25 EC640 ml/acre in 200 litres of water.	

Brown Plant Hopper (BPH) (ETL: 5-10 hoppers/hill. 	Spray azadirachtin 0.15% neem seed kernel-based EC formulation@ 800 ml/acre, **or** pymetrozine 50% WG @ 120 g/acre, **or** imidacloprid 17.8% SL @ 50 ml/acre, **or** thiamethoxam 25 WG 40 g/acre **or** triflumezopyrim 10% SC 95 g/acre or dinotefuran 20% SG@ 80 g/acre or acephate 75% SP @ 400 g/acre. ▪While spraying nozzle should be directed towards basal portion of the plants. Repeat application if hopper population persists beyond 10days after first application.	
Gundhi bug (ETL: 2 bugs/hill or 5 bugs/ sq.m.)	Spray carbaryl 50 WP 600 g/acre, **or** ethofenoprox 10EC @ 200 ml/acre or dust methyl parathion 2 D @ 10kg/acre, **or** apply dust formulation of malathion or carbaryl 10 DP @ 12kg/acre.	
Ear eating caterpillar (ETL:1 larva/hill or 4-5 larvae/m^2)	Spray quinalphos 25 EC 400ml/ acre, **or** triazophos 40 EC 400ml/ acre or chlorpyriphos 20EC @ 500ml/acre during morning hours.	
Gall midge (ETL: one silver shoot / sq. m.)	Apply granular insecticide like Fipronil 0.3% G @ 10kg/acre at 3 weeks after transplanting if 5%	

Diseases		
Foliar or leaf blast - seedling to tillering stage. Neck-blast - panicle initiation to booting stage. 	On appearance of 1-2 spot per leaf spray carbendazim 12% + macozeb 63% WP @ 2 g/lit, **or** iprodine 25%+ carbendazim 25% WP @ 1g/lit or carbendazim 50% WP @ 2g/lit. **or** tebuconazole 50% + trifloxystrobin 25% WG @ 0.4 g per lit of water. Repeat the spray at 7-10 days interval. Total spray volume required per acre is 200 litre.	
Brown spot	Spray the crop with propiconazole 25EC @ 1ml or mancozeb 75WP or carbendazim 50WP @ 2g of water or carbendazim 64%+mancozeb 8% 75WP @ 1.5g per litre of water.	
False smut (The disease is found only when ear heads are formed)	Spray copper hydroxide 77% WP @ 2.5 g **or** tebuconazole 25EC @ 1 ml **or** mancozeb 75WP @ 2.5 g per litre of water. Spray two times during booting and 50% flowering stages.	
Sheath rot	spray carbendazim 50% WP @ 2 g/lit or propiconazole 75 WP @ 1 ml **or** hexaconazole 5EC @ 2ml **or** carbendazim 12% + mancozeb 63% WP @ 2 g per lit of water. Repeat the spray at 10 days interval	

Bakanae:	When 1-2 diseased hills are observed spray carbendazim 50WP @ 1g per litre of water	
Bacterial blight	Spray with streptomycin sulphate 90% + tetracycline hydrochloride 10% @ 100-150 ppm or streptocycline 150 mg + copper oxychloride 1gm per litre of water or plantomycin @ 1g/lit of water. ▪ As an alternate to chemicals spray *Pseudomonas fluorescens* @ 10 g/kg (talc-based formulation) during cool hours.	

(viii) Harvesting and post-harvest processing

• Harvest the crop at physiological maturity close to the ground leaving only10-15 cm of stubbles when about 80-85% of the grains in the panicles are grey in colour (straw colour).

• For hard soil and non-lodged crop of rice, power tiller or tractor operated vertical conveyor reaper (VCR) or combiner should be used for harvesting.

• Threshing of paddy should be done at 18-16% moisture by pedal operated paddy thresher or power operated paddy thresher.

▪ Hand operated/power operated mechanical winnower should be used for winnowing purpose.

▪ The combined harvester can perform the operations of harvesting, threshing, winnowing, and bagging in one operation.

▪ Sundry the threshed seeds uniformly in cemented floor/ tarpaulin sheet for 1-2 days to bring down the moisture level to 14% for milling purpose. But for seed purpose the seeds should be dried up to 12 % moisture.

▪ Sun dried grains should be stored in super grain bags or gunny bags lined with poly-ethylene for safe storage.

(B) Good agricultural practice for rice-pulse cropping sequence in coastal Odisha

(i)Green gram and black gram in rice-based cropping system

**Green gram varieties*: PDM-11, PDM-54, IPM-02-03, IPM-02-14, OUM 11-5, OBG9-52.

**Black gram varieties*: Prasad, Ujala, PU 31, PU 35.

**Optimum sowing time*: Sept-Oct as pre rabi crop under contingent plan, rabi (November-December), Summer (mid-February-first week of March)

*Use seed rate of 10 kg/acre.

*Seed treatment with fungicide like carbendazim (2g/kg of seed) or thiram (3g/kg of seed) of
green gram, black gram and ground nut at least one week before *Rhizobium* treatment.
*Suspend 200g of *Rhizobium* culture and 250g phosphate solubilizing bacteria (PSB) in 600 ml of water and mix thoroughly. Now pour the slurry on 10 kg of seed drop by drop and mix with the hands till the uniform coating of culture is obtained on all seeds. Addition of molybdenum in the form of Ammonium or Sodium molybdate @ 3 g/10kg seeds at the time of seed treatment with *Rhizobium* culture, facilitates better nodulation. Dry the treated seeds in shade on clean cloth, paper or polythene sheet and sow them immediately, preferably in afternoon.
*Sowing by zero-till planter or line sowing behind the plough or sowing by seed drill at 25 cm ×10cm ensures optimum plant population.
*Use 8:16:8:8 kg of N:P: K: S/acre as basal dose and apply at the time of final land preparation or by fertiliser cum seed drill.
*Application of post emergence herbicides like quizalofop ethyl @ 50 g *a.i*/ha at 3 weeks crop growth stage to control monocot weeds **or** imazethapyr @ 75 g *a.i*/ha at 15-20 days crop stage to control weeds.
*Foliar spray of DAP (2%) or 1% DAP + 1% MOP at 20 and 40 days after sowing to supplement N, P and K to the crops.
• Foliar application of borax@ 0.2% at flower initiation stage in boron deficient soil.
*Apply light irrigation at flowering and pod formation stage to achieve the potential yield of the varieties.
*Spraying acetamiprid (60 g/acre) or imidacloprid (50 g/acre) or thiomethoxam (80 g/acre) with 200 lit of water against sucking pests such as white fly, aphids, thrips etc.
• Spraying 600 ml neem oil followed by Indoxacarb (200 ml) with 200 lit of water/acre to control pod borer.
• Application of 2 trichocards/acre twice for a crop, once at pod initiation stage and ten days after first application.
• Spraying of redomil MZ (400 g) along with streptocyclin (20 g) in 200 lit of water to root zone of the crop to control wilt diseases.
• Spraying Sulphur wettable powder @ 800 g with 200 lit of water to control powdery mildew disease.
* In rainfed shallow lowland sow the seeds of green gram/ black gram @ 12kg/acre at 10-15 days before the harvest of wet season rice in saturated soil. Maintain rice stubble height of 10-15 cm for better growth and yield of *paira* crops. If needed apply post emergent herbicide quizalofop-ethyl @ 0.02 *a.i,* kg/acre at 15-20 DAE for weed control. Foliar application of DAP (1%) + MOP (1%) is recommended for enhancing the yield of *paira* crops. One live saving irrigation at branching/flowering is desirable.
**Harvesting and storage*: Harvest when pods turn brown by cutting from close to ground level by using sickles

(C)Vegetables in rice-based production system in coastal Odisha

(i) Rice-vegetables, rice-pulses/oilseeds-vegetables cropping sequence are popular in the region. Selection of suitable crop, crop varieties and adoption of appropriate management practices ensures the profitability and sustainability of rice production system. Vegetables grown under rice-based sequence either in rabi or spring of summer season and some management practices are listed in Table 5.

Table 5: Vegetables for rice-based production system in coastal Odisha

Vegetables	Popular Varieties with Season	Seed rate, crop establishment and spacing, Fertilizer
Brinjal	Pusa purple cluster (K, S), Kashi Sandesh (S), Kashi Komal (S), Utakal Keshari, Utakal Madhuri, Utakal Tarini, Utkal Anushree, Arka Neelachal Shyama	Seed rate (hybrids 80g/acre OP 160 g /acre, 25-30 days seedlings on furrows 60×45 cm, suitable for BBF planting and drip irrigation, responded to mulching, 5t FYM+ 50:20:30 kg of N: P: K/acre in 3 split doses
Tomato	Pusa 120 (R, S), Kashi Vishesh (R), Kashi Hemant (R), Utakal Kumari (R), Tomato BSS 488 (K, R), Arka Rakshak (hyb), Arka Samrat (hyb), Arka Abhed (hyb), Kalinga Tomato 121 (OP), Kashi Chyan)	Seed rate (OP-200g/acre, hyb-80 g/acre, 20-30 days seedlings in furrows at 60x 30cm, suitable for BBF planting and drip irrigation, responded to mulching, 10t FYM + 50:20:40 kg of N: P: K/acre in 3 split doses
Cauliflower	Pusa Snowball K-1 (R), Pusa Snowball KT 25 (R), Pusa early Synthetic (R), Pusa Katki (R), Pusa Sharad (R), Pusa Deepali	Seed rate 200-300 g/acre, 20-25 days old seedlings are transplanted in furrows at 60×45cm, suitable for BBF planting and drip irrigation, responded to mulching, 10t FYM+ 48:24:16 kg of N: P: K/acre in 3 split doses
Cabbage	Pusa Ageti (R, S), Golden Acre (R), Pusa Drum head (R), Pride of India (R), Puas Synthetic	Seed rate 0.2kg/acre, 25-30 days old seedlings are transplanted in furrows at 60× 30cm, suitable for BBF planting and drip irrigation, responded to mulching, 10t FYM+ 60:20:30 kg of N: P: K/acre in 3 split doses
Knol Khol	PurpleVienna (R), White Vienna (R)	Seed rate 400 g/acre, 25-30 days old seedlings are transplanted in furrows at 45 × 20 cm, suitable for BBF planting and drip irrigation, responded to mulching, 10t FYM+ 40:20:20 kg of

		N: P: K/acre in 3 split doses
Potato	Kufri Chandramukhi (R, 90-100 days), Kufri Jyoti (R, 90-100 days), Kufri Lauvkar (R, 75-80 days), Kufri Badshah (100-10 days), Kufri Pukhraj (R, 70-90 days), Kufri Surya (R, 75-90 days)	8-10 q/acre, 45×30 cm, dibbling of seed tuber on raised bed at 45×30 cm followed by mulching with paddy straw, FYM 6-8 t + 40:20:32 kg of NPK/acre, suitable for drip irrigation
Garden pea	Pusa Pragati (R), Arkel (R), Bonneville (R), Kashi Uday, Kashi Nandini	Seed rate 40kg/acre, Line sowing of seeds at 30×10cm, FYM 8t+ 20:20:20 kg of N: P: K/acre in 2 split doses
French bean	Contender (bushy) (R), Pusa Parvati (R, Sp), Arka Anoop (bushy, R), Arka Sukomal (pole type) (K, R), Arka Arjun (bushy), Arka	Seed rate (bushy -20-25kg/acre, pole type- 10-12 kg/acre, dibbling on ridges at 45×20cm, FYM 10 t+20:32:20 kg of N: P: K/acre in two splits.
	Sharath (bushy)	
Okra	Pusa Sawani (S), Arka Anamika (K, S), Pusa A4 (K S), Kashi Pragati (K, S), JOH-05-9 (K S), JPL-2k-19 (K S), AROH-631 (K S), Arka Nikitha (hyb), Kashi Chaman	Seed rate 4-5 kg/acre for summer, 3-4 kg/acre for rainy season, dibbling of seeds at 60×30 cm, Apply FYM 3t + 32:16:16 kg/acre in 3 split doses. Responds to micro irrigation
Pumpkin	Pusa Vishwas (K S), Swarna Amrit (S), Arka Suryamukhi (S), Guamal local (K S), Arka Chandan, Baidyabati, Kashi Shisir, Kashi Harit, Swarna Amrit	Seed rate 1kg/acre, dibbling of 5-6 seeds in pit (45×45×45 cm) at 1.8 m apart, FYM 1t+ 30:30:30 kg of N:P: K/acre in 2 split doses
Bitter gourd	Pusa hybrid 2(K, S), Swarna Yamini (K, S), NBIH 2009 (K, S), Kashi Mayuri, Arka Harit	Seed rate 1kg/acre, dibbling of 3-4 seeds in pits (30×30×30 cm) at 150x100 cm apart, FYM 6t + 24:12:12 kg

		of NPK/acre in 3 splits
Pointed gourd	Swarna Rekha (R Sp), Swarna Alaukik (R Sp), Swarna Suruchi (R Sp), Arka Neelanchal Kirti (Sp S)	1200-1500 rooted cuttings/acre during winter/ vine cuttings during spring, Plant in flat bed or BBF at 1mx1m, followed by mulching. Respond well to drip irrigation, FYM 5t/ha + 48:32:32 kg of N:P:K/acre in 3-4 splits
Ridge gourd	Pusa Nasdar (K), Swarna Manjari (K S), Pallavi (K S), Swarna Upahar (K S), Swarna Sawani, Arka Prasan, Arka Vikram	Seed rate 2-2.5 kg/acre, dibbling of 3-4 seeds in pits (30×30×30 cm) at 150×100 cm apart, FYM 6t+ 20:12:12 kg of NPK/acre in 3 splits
Bottle gourd	Pusa summer prolific long (S), Pusa hybrid 3 (K, S), Santosh 20 (Sp S), Anurag (Sp S), PBOG 81, Swarna Sneha (Sp, S), Utkal Sobha, Arka Bahar, Swarna Sneha, Kasha Kundal	Seed rate 2 kg/acre, dibbling of 3-4 seeds in pits (30×30×30 cm) at 150×100 cm apart, FYM 6t+ 24:12:12 kg of NPK/acre in 3 splits
Cucumber	Swarna Ageti (S), Swarna Sheetal (S), Swarna Poorna (S), DC 43 (S)	1.2 kg/acre, dibbling of 3-4 seeds in pits (30×30×30cm) at 150 × 60cm apart, respond well to mulching and drip irrigation, FYM 6t+ 20:12:30 kg of NPK/ha for HYV, 60:36:36 kg NPK/acre for hybrids in 3 splits
Radish	Pusa Chekti (Sp, S, K), Japanese white ®, Pusa Reshmi ®, Pusa Desi ®, Pusa Himani ®, Arka Nishant ®, Kashi Sweta	Seed rate 4kg/acre, Dibbling of seeds on ridges at 30×10 cm, FYM3t+ 20:20:30 kg of N :P:K/acre in 2 split doses
Amaranthus	Arka Samraksha (YR), Arka Varna (YR), Pusa Lal Chauli (K, S), Pusa Kirti (S),	Seed rate 0.8kg/acre for khada, 2.0-2.5 kg/acre for kosala, Dibbling of 30days old seedlings of

	Pusa Kiran (K), Arka Suguna, Arka Arunima, Arka Smaraksha	khada at 50 × 30cm, FYM 10t+20:16:12 kg of N: P: K/acre in 2 splits 40-50 t/ha
Chili	Pusa Jwala (K, Sp), Pusa Sadabahar (K, Sp), Arka Lohit (K, Sp), Arka Meghana (K, S), Kashi Surkh (K, S), Pant C-1 (K, S), Uttakal Ragini, PC-56 (K, R ,S), Arka Harita, Arka Sweta, Arka Khyati, Swarna Praphulya, Arka Neelachal Prabha	Seed rate 300 g/acre, plant 30-40 days old seedlings in furrow at 50×30 cm, Responds to drip irrigation, FYM 5t+48:20:32 kg of N P: K/acre in 3 split doses
Cowpea	Kashi Kanchan (K, S), Swarna Mukut (K, S), Ankur Gomti (K S), Arka Mangala, Arka Garima	Seed rate 10kg/acre, dibbling of seeds in furrows at 45×15cm, FYM 6t+10:20:20 kg of N:P:K/acre in 2 splits
Colocasia	Muktakeshi(K, S), Telia (K S), Topi (K), Sankha Saru (Sp)	Seed rate 0.8 t/acre seed tuber, dibbling of seed tuber on furrows at 60x45 cm, FYM 5t+ 32:24:32 kg of NPK/acre in 3 splits.
Sweet potato	Bhu Krishna ®, Bhu Sona ®, Saurin (K, R), Kalinga (K, R), Kanchangar d Local (K R)	83000cuttings/ ha, plant vines on ridges at 60x20cm, FYM 2t+30:20:20 kg of NPK/acre in 2 splits
Capsicum	California wonder (R), Pusa Deepti (R), Arka Mohini (R), Arka Gourav (R), Arka Basant (R)	Seed rate 0.3kg/acre, plant 30-35 days old seedlings in furrows at 60x30cm, FYM 8t+48:24:48 kg of N:P:K/acre in 3 splits, Respond well to mulching and micro irrigation
Carrot	Nantes (R), Pusa Kesar ®, Pusa Yamdagni (R) , Kashi Krishna, Pusa Vrishti	Seed rate 2to 2.5kg/acre, dibbling of seeds on ridges at 30×10 cm, FYM 3t+20:20:30 kg of

		N:P:K/acre in 2 splits.
Dolichos bena (Sem)	Kashi Sheetal, Swarna Rituvar, Swarna Utkrisht, Arka Vistar (pole), Arka Amogh, Arka Swagath (pole)	Seed rate 4-5kg/acre in pole type and 8-10 kg/acre for bushy type, spacing depends upon the type of plants, dibbling method for planting, 3tonnes of FYM/acre 8:24:24 kg N:P:K/acre

(ii) Nursery for vegetable crops:
Nursery bed should be prepared by equal parts of sand, red earth and well rotten farm yard manure may be mixed with the soil and the beds should be raised to 10-15cm height. The seeds should be treated with thiram or captan @ 2g/kg of seeds or *Trichoderma* dust formulation @ 10 g/kg of seeds. The seeds are sown in lines spaced at 5cm. After sowing, the seeds must be covered with fine sand and soil. The nursery must be watered twice a day in the initial stages until germination is completed. It is desirable to harden the seedlings before transplanting by withholding watering for last 2-3 days. The seedlings will be ready in about 25-40 days depending upon the kind of vegetable. Farmers are advised to raise seedlings of high value crops in portrays facilitating easy transportation, enhanced vigour and very less mortality.

(D) Conclusion: Appropriate cropping sequence with suitable varieties coupled with optimum management practice will enhance the productivity of rice-based production system in coastal Odisha. Harvesting at optimum time, processing immediately after harvest and appropriate storage is required to minimize the loss and safe disposal of farm produce at competitive price will ensure increase in farm profitability.