TRANSFERRABLE TECHNOLOGIES

CROP IMPROVEMENT

Crop improvement programmes of OUAT till date, has resulted in development of 147 new varieties of cereals, pulses, oilseeds, vegetables and other allied crops to cater the varietal needs of the diverse agro ecological situations of Odisha. Many of these varieties are very popular among the farmers of Odisha due to high yield, better quality and adaptability. Still there is a continuous demand from the farmers of Odisha for new crop varieties to better fit to the changing climatic situation along with higher productivity and better quality to make farming profitable and sustainable. Research on crop improvement in the last year has generated many new technologies as presented in the following pages.

Rice

(a) OR 2172-7 (Pratibha)

Status of release: submitted to SVRC for release
Duration : 125 days,
Potential yield : 52.3 q/ha
Adaptability : Rainfed and Irrigated medium land
Yield Advantage : 12.0 % over Lalat
Other characteristics: Resistance to Brown spot and glume
discolouration
Importance: to replace Lalat which is more than 10 years old.

(b) OR 2327-23 (Pradeep)

Status of release: submitted to SVRC for release
Duration : 130 days,
Potential yield : 51.0 q/ha
Adaptability : Rainfed and Irrigated medium lands
Yield Advantage : 11.8 % over MTU 1001
Other characteristics: Moderately resistant to Leaf blast, Sheath blight, Sheath rot and whorl maggot.
Importance: to substitute old varieties like MTU 1001
Finger millet

(a) **OEB 526 (Arjun)**
Status of release: submitted to CVRC
Duration : 126 days
Potential yield : 20.7 q/ ha
Adaptability : Rainfed uplands during kharif and irrigated summer planting
Yield Advantage : 15 % over Bhairabi
Other characteristics: Moderately resistant to Leaf blast, neck blast, finger blast and brown seed.
**Importance:** Number of varieties are limited. So new varieties with better characteristics are required.

(b) **OEB 532 (Kalua)**
Status of release: submitted to SVRC
Duration : 110 days,
Potential yield : 17.6q/ ha
Adaptability : Rainfed uplands during kharif and irrigated summer
Yield Advantage : 13.7 % over Bhairabi
Other characteristics: Resistant to Leaf blast Neck blast and brown seed.
**Importance:** Number of varieties are limited, so new varieties with better characteristics are required.

Grain Amaranthus

(a) **BGA 19 (Ruchi)**
Status of release : identified for release by Variety Identification Committee of ICAR
Duration : 88 days,
Potential yield : 15.4 q/ ha
Adaptability : Irrigated uplands/medium lands of Odisha in rabi
Yield Advantage : 23.3% over the only prevailing variety BGA-2 (Kapilas)
Other characteristics: Field resistance to stem weevil, leaf webber and stem rot
**Importance:** To replace BGA-2 as it is more than 10 years old.
(b) **BGA 27 (Prachi)**

Status of release: identified for release by Variety Identification Committee of ICAR
Duration : 87 days
Potential yield : 15.4 q/ ha
Adaptability : irrigated uplands/ medium lands
Yield Advantage : 23.3% over the only prevailing variety BGA-2 (Kapilas)
Other characteristics: Field resistance to stem weevil, leaf webber and stem rot
**Importance:** To replace BGA-2 as it is more than 10 years old.

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**Black gram**

(a) **OBG 33 (Sashi)**

Status of release: submitted to SVRC
Duration: 75 days
Potential yield: 8.4 q/ ha
Adaptability: Rabi season and rainfed uplands during kharif in Odisha
Yield Advantage : 13.5 % over Prasad
Other characteristics: Moderately resistant to YMV, Anthracnose and Powdery mildew
**Importance:** Black gram varieties are few in number. This is an new addition.

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**Groundnut**

(a) **ICGV 02266**

Status of release: identified for release
Duration : 120-125 days
Potential yield : 25 q/ ha
Adaptability : Suitable for rabi season
Yield Advantage : 11.5 % over Smruti
Other characteristics: Moderately resistant to foliar diseases
**Importance** : To replace the old varieties which are more than 10 years old.
Sesamum

(a) **OSC 79**
Status of release: identified for release in Odisha
Duration : 79 - 85 days
Potential yield : 940 Kg/ ha
Adaptability : Rainfed kharif
Oil Content : 47-52%
Other characteristics: Resistant to phyllody and *Alternaria* leaf spot
**Importance:** Mandate is to develop new varieties suitable for Odisha

Sugarcane

(a) **CoOr10346 (Charchika)**
Status of release: Submitted to SVRC
Duration : Mid late
Average yield : 110 t/ ha
Adaptability : Rainfed and irrigated uplands
Yield Advantage : 11.8 % over the best check, Co 86249.
Other characteristics: Resistant to red rot.
**Importance:** To develop new variety suitable for Odisha

Cotton

(a) **BS 279**
Status of release: submitted to SVRC
Duration : 150 days
Potential yield : 23.3 q/ ha under normal planting and 28 q/ ha under high density planting
Adaptability : irrigated upland
Yield Advantage : 15% over the check, MCU-5
Other characteristics: Resistant to Jassids, Aphids, *Alternaria* leaf spot, *Myrothecium* leaf spot & Seedling rot
(b) BS 30
Status of release: submitted to SVRC
Duration : 150 days
Potential yield : seed cotton yield of 22.7 q/ha under normal planting and 27.9 q/ha under high density planting
Adaptability: Rainfed eco system
Yield Advantage: 15% over the check, MCU-5.
Other characteristics: Resistant to Jassid, Aphids, Alternaria leaf spot

Tomato
(a) BT-136(Pant T-3 X Azad Kirti)
Status of release: submitted to SVRC
Duration: 100-105 days
Potential yield : 435 q/ha
Yield Advantage: 37% over check (Arka Vikas)
Other characteristics: Tolerant to bacterial wilt having good keeping quality and transportability
Importance: To develop varieties tolerant to bacterial wilt which is a serious disease in Odisha and good storability and keeping quality.

Chilli
(a) BC-25 (BC 12-3 x Lam X235)
Status of release: submitted to SVRC
Duration: 130 to 135 days
Potential yield: Red ripe Chilli, 103.4 q/ha.
Yield Advantage: 50% over check (LCA-206).
Other characteristics: Tolerant to bacterial wilt and biotic stresses such as anthracnose, dieback, aphid and thrips
Importance: To develop varieties tolerant to bacterial wilt which is a serious disease in Odisha with higher yield than Utkal ava and Utkal rashmi.

(b) BGC 10-C-1 (BGC 3-2 X Indonesian selection)
Status of release: submitted to SVRC
Duration: 114 days
Potential yield: 130 q/ha (green chilli)
Yield Advantage: 37% over check (LCA-206).
Other characteristics: Resistant to bacterial wilt
Importance: To develop varieties tolerant to bacterial wilt which is a serious disease in Odisha with higher yield than Utkal ava and Utkal rashmi
Ridge gourd

(a) **BRG 3-1 (Selection from local germplasms of Odisha)**

Status of release: submitted to SVRC  
Duration : 55 to 60 days  
Potential yield : 115 q/ha  
Adaptability : kharif uplands  
Yield Advantage : 38% over check (Pusa Nasdar)  
Other characteristics: Tolerant to anthracnose and downy mildew and land race of the state bearing cent-percent perfect flowers  
**Importance:** To release one variety for Odisha better than the ruling variety, Pusa Nasdar

Country bean

(a) **BDB-2 (Selection from local germplasms of Odisha)**

Status of release: submitted to SVRC  
Duration : 95-105 days  
Potential yield : 101 q/ha  
Yield Advantage : 47% over local check  
Other characteristics: Tolerant to leaf spot and wilt  
**Importance:** To release first variety for Odisha with good yield advantage over local check

Ginger

(a) **V1E8-2 (Subhada)**

Status of release: submitted to SVRC  
Duration : 223 days  
Potential yield : 18.3 t/ha  
Adaptability : Recommended for hills and planes of Odisha and suitable for both rain fed and irrigated conditions  
Yield advantage : 12.4% over national check, Varada  
Other characteristics: Moderately tolerant to leaf spot, bacterial wilt, soft rot, shoot borer and scale insect, drought tolerant  
**Importance:** To develop a variety suitable for hills and planes of Odisha with low fibre and high oleoresin content
Turmeric

(a) PTS-59 (Surangi)

Status of release: submitted to SVRC
Duration : 233 days
Potential yield : 23.4 t/ ha
Adaptability : Suitable for 15 days late and early planting, suitable for both for rain fed and irrigated condition in hill and planes with seed rate – 20q/ha
Yield Advantage : 20.2% over national check ‘Pratibha’ and 9.6% over local check ‘Roma’
Other characteristics: Curcumin content 6.5%, Oleoresin 12.7%, essential oil 4.6%, dry recovery-28.4%
Importance: develop a new variety for planes and hills of Odisha with better quality.

CROP PRODUCTION

Crop production technologies deal with the scientific study of plant and soil under different environmental conditions to increase the production, productivity and sustainability of crops and cropping system. In past the university has developed many suitable cost effective technologies which have widely accepted by the farming communities of the state. In the present context of changing climatic condition and to achieve the targeted yield potential, new production technologies should be developed, refined and validated. Research in crop production during 2015-16 has generated several new technologies, which are presented below:

(a) Urdbean + maize (1:1) intercropping system

In rainfed upland situation urdbean + maize (1:1) intercropping system is remunerative compared to sole urdbean and maize.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Urdbean equivalent Yield (Kg/ha)</th>
<th>Net return (Rs/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urdbean + Maize (1:1)</td>
<td>1381</td>
<td>38,805</td>
</tr>
<tr>
<td>Urdbean Sole</td>
<td>671</td>
<td>14,828</td>
</tr>
<tr>
<td>Maize Sole</td>
<td>1176</td>
<td>28,350</td>
</tr>
</tbody>
</table>

Action : OFT in KVK keonjhar, Dhenkanal, Kandhamal, Nabarangpur and Mayurbhanja -II
(b) Varietal substitution in mustard for higher yield

New mustard genotype NRCHB 101 (early juncea group) for irrigated upland and medium land situation recorded highest seed yield of 1146 kg/ha and is recommended in place of ‘Pusa Jaikishan’ and ‘Pusa Agrani’.

<table>
<thead>
<tr>
<th>Mustard variety</th>
<th>Yield (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRCHB 101</td>
<td>1146</td>
</tr>
<tr>
<td>Existing var.(Pusa Agrani)</td>
<td>928</td>
</tr>
<tr>
<td>Existing var.(Pusa Jai Kishan)</td>
<td>1009</td>
</tr>
</tbody>
</table>

**Action**: OFT in KVK Kandhamal, Bhadrak, Balasore, Sambalpur, Baragarh

(c) Remunerative agro-forestry system for rainfed upland

Intercropping of pineapple (Queen with spacing 75 cm X 60 cm) in established mango orchard (Amrapalli with spacing 6 m X 5.5 m) gives Rs 83400 more net return per annum than sole crop of mango.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Yield(t/ha)</th>
<th>Net Return (Rs/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>2.2 Mango</td>
<td>1,26,200</td>
</tr>
<tr>
<td></td>
<td>7.4 Pineapple</td>
<td></td>
</tr>
<tr>
<td>Existing (sole mango plantation)</td>
<td>2.5 Mango</td>
<td>42,800</td>
</tr>
<tr>
<td></td>
<td>_ Pineapple</td>
<td></td>
</tr>
</tbody>
</table>

Suitability: Established mango orchards of all ACZs
Assessment through OFT in KVKs in existing mango orchards

**Action**: OFT in KVK Sonepur, Angul, Ganjam II, Kandhamal.

(d) Use of Microbial Culture for faster Jute Retting

Jute retting with CRIJAF make microbial consortium culture (@20 kg/ha reduced retting period by a week.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Duration of retting (days)</th>
<th>Colour of fibre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retting with microbial consortium culture</td>
<td>12</td>
<td>Whitish to Golden</td>
</tr>
<tr>
<td>Retting without Culture</td>
<td>19</td>
<td>Grayish White</td>
</tr>
</tbody>
</table>

**Action** - OFT in KVK Balasore and KVK Kendrapara

(e) Effective use of Biofertiliser in non pulse crops

Inoculation of Azotobacter, Azospirillum and PSM 4.0 kg each ha\(^{-1}\) with prelimed (5%) FYM/VC in( 1: 25) incubated for 7 days at 30% moisture and applied in the rhizosphere on the day of planting or sowing of crops is recommended for higher efficiency as the technology causes faster multiplication of the bio-inoculant.
<table>
<thead>
<tr>
<th>Organism</th>
<th>Population (CFU x 10^7 g^-1)</th>
<th>Without treatment</th>
<th>Inoculated to prelimed (5%) vermicompost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azotobacter</td>
<td>2.70</td>
<td>5.40</td>
<td></td>
</tr>
<tr>
<td>Azospirillum</td>
<td>6.00</td>
<td>9.00</td>
<td></td>
</tr>
<tr>
<td>Phosphorus Solubilizing Bacteria</td>
<td>0.18</td>
<td>2.00</td>
<td></td>
</tr>
</tbody>
</table>

Adaptibility: Upland Cereals, oilseeds, vegetables, fruits, floriculture

**Action:** All KVKs in non pulse crops.

(f) **Effective use of Biofertiliser in greengram.**

Seed inoculation of pulse crops with *Rhizobium* (1.0-1.5 kg ha^-1) treated with 10 g Sodium Molybdate per 25 kg seed, followed by rhizospheric application of 4 kg PSM ha^-1 mixed with lime 0.2 LR and FYM 2 t ha^-1 increases greengram yield.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Greengram Seed yield (kg ha^-1)</th>
<th>Rupee earned per rupee invested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology along with STBR</td>
<td>960</td>
<td>2.15</td>
</tr>
<tr>
<td>Present Practice (STBR)</td>
<td>540</td>
<td>1.60</td>
</tr>
</tbody>
</table>

**Action:** In all pulse hubs

(g) **INM in Brinjal for higher yield and more profit**

Application of 75% of STBR Fertilizer N + *Azotobacter* 4 Kg/ha + *Azospirillum* 4 Kg/ha + full P and K in brinjal recorded maximum fruit yield of brinjal of 36.1t/ha resulting in 17% increase over existing practice.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Fruit yield (t ha^-1)</th>
<th>B:C ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>36.1</td>
<td>3.39</td>
</tr>
<tr>
<td>Present Practice (STBR)</td>
<td>30.9</td>
<td>2.90</td>
</tr>
</tbody>
</table>

**Action:** OFT in all KVKs

(h) **INM in Turmeric for higher yield**

100% Soil Test Based NPK + *Azospirillum* + *Azotobacter* 10 kg/ha + Vermicompost 5 t ha^-1 in turmeric(Roma) recorded highest rhizome yield resulting 16% higher yield than the present practice.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Rhizome yield (t ha^-1)</th>
<th>Response (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>21.92</td>
<td>16.0</td>
</tr>
<tr>
<td>Present practice 100% Soil Test based recommendation (75-38-90: N-P_2O_5-K_2O kg/ha^-1)</td>
<td>19.69</td>
<td></td>
</tr>
</tbody>
</table>

**Action:** OFT in KVK Koraput, Kandhamal

(i) **Nutrient management through Fertiliser Prescription Equation in Sesamum**
Nutrient management through Fertilizer prescription equation produces 12-18% higher yield than common soil test based recommendation in sesamum under irrigated upland condition.

Targeted Yield Equations are:

- \( FN = 23.32 \cdot T - 0.92 \cdot SN - 1.25 \cdot ON \)
- \( F P_2O_5 = 9.45 \cdot T - 2.7 \cdot SP_2O_5 - 0.5 \cdot OP_2O_5 \)
- \( F K_2O = 8.60 \cdot T - 0.39 \cdot SK_2O - 1.98 \cdot OK_2O \)

<table>
<thead>
<tr>
<th>Targeted yield equations for Sesamum (cv. Uma)</th>
<th>Soil type</th>
<th>Yield Target</th>
<th>Yield advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>( FN=23.32 \cdot T-0.92 \cdot SN-1.25 \cdot ON )</td>
<td>Red, yellow and lateritic soils</td>
<td>8-12 q ha(^{-1})</td>
<td>About 12 to 18% more yield than soil test based recommendation</td>
</tr>
<tr>
<td>( F P_2O_5 = 9.45 \cdot T-2.7 \cdot SP_2O_5 - 0.5 \cdot OP_2O_5 )</td>
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<td>8-12 q ha(^{-1})</td>
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</tr>
<tr>
<td>( F K_2O = 8.60 \cdot T-0.39 \cdot SK_2O - 1.98 \cdot OK_2O )</td>
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<td>8-12 q ha(^{-1})</td>
<td>About 12 to 18% more yield than soil test based recommendation</td>
</tr>
</tbody>
</table>

**Action:** OFT in all KVKs

(j) **Nutrient Management through Fertiliser Prescription Equation in French bean**

Nutrient management through Fertilizer prescription equation developed by STCR project for French bean for lateritic irrigated upland produces 12-18% higher yield in French bean.

Targeted Yield Equations

- \( FN = 1.6 \cdot T - 0.5 \cdot SN \)
- \( FP_2O_5 = 1.5 \cdot T - 1.0 \cdot SP_2O_5 \)
- \( F K_2O = 3.0 \cdot T - 1.1 \cdot SK_2O \)

<table>
<thead>
<tr>
<th>Targeted yield equations for French bean (cv. Anupam)</th>
<th>Soil type</th>
<th>Yield Target</th>
<th>Yield advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>( FN= 1.6 \cdot T - 0.5 \cdot SN )</td>
<td>Red, yellow and lateritic soils</td>
<td>60-90 q ha(^{-1})</td>
<td>About 12 to 18% more yield than soil test based recommendation</td>
</tr>
<tr>
<td>( FP_2O_5 = 1.5 \cdot T - 1.0 \cdot P_2O_5 )</td>
<td>Red, yellow and lateritic soils</td>
<td>60-90 q ha(^{-1})</td>
<td>About 12 to 18% more yield than soil test based recommendation</td>
</tr>
<tr>
<td>( F K_2O = 3.0 \cdot T - 1.1 \cdot K_2O )</td>
<td>Red, yellow and lateritic soils</td>
<td>60-90 q ha(^{-1})</td>
<td>About 12 to 18% more yield than soil test based recommendation</td>
</tr>
</tbody>
</table>

**Action:** OFT in all KVKs
(k) Sulphur Management in different Crops

Basal application of 45 kg S/ha to ground nut and 30 kg S ha\(^{-1}\) each to green gram and rice along with soil test based fertilized NPK and FYM increased yield by 68, 35 and 15 per cent over control in sulphur deficient soils.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Sulphur dose</th>
<th>Pod or seed yield (kg ha(^{-1}))</th>
<th>B:C ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Without Sulphur</td>
<td>With sulphur</td>
</tr>
<tr>
<td>Ground nut</td>
<td>45 kg S ha(^{-1})</td>
<td>1750</td>
<td>2950</td>
</tr>
<tr>
<td>Greengram</td>
<td>30 kg S ha(^{-1})</td>
<td>630</td>
<td>853</td>
</tr>
<tr>
<td>Rice</td>
<td>30 kg S ha(^{-1})</td>
<td>4100</td>
<td>4700</td>
</tr>
</tbody>
</table>

Action: RRTTS Mahisapat, Chiplima for S on groundnut

(l) Zinc Management in Rice

Basal application of Zinc 2.5 kg ha\(^{-1}\) along with soil test based fertilized NPK and 5 t FYM/ha increased rice yield by 10.4% over non application of Zn in Zn deficient soil

<table>
<thead>
<tr>
<th>Practice</th>
<th>Grain yield (kg ha(^{-1}))</th>
<th>Response (%)</th>
<th>B:C ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>STBR NPK + Zn 2.5kg ha(^{-1})</td>
<td>4650</td>
<td>10.4</td>
<td>1.88</td>
</tr>
<tr>
<td>STBR NPK</td>
<td>4210</td>
<td></td>
<td>1.63</td>
</tr>
</tbody>
</table>

Action: RRTTS-Chiplima, Bhawanipatna and Ranital for Zn in paddy OIC,AICRP-Micronutrient to prepare micronutrient map for all the districts.

(m) Recommendation of B and Zn for Higher Yield in Maize

Boron, 0.5 kg ha\(^{-1}\) and Zinc, 2.5 kg ha\(^{-1}\) supplementation to soil test based fertiliser NPK increased the yield of maize by 20 % over STBR NPK.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Grain yield (kg ha(^{-1}))</th>
<th>Response (%)</th>
<th>B:C ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>6740</td>
<td>19.5</td>
<td>2.46</td>
</tr>
<tr>
<td>Present Practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBR (100-50-60 kg ha(^{-1}) N: P(_2)O(_5): K(_2)O)</td>
<td>5640</td>
<td>2.10</td>
<td></td>
</tr>
</tbody>
</table>

Action: All KVKs for GPS based soil testing, RRTTS and nearby college farms which is to be validated by HOD, Soil Science.
(n) **INM for Rice-Lathyrus Cropping System**

2.5 t FYM + 5 kg Zn + 20 kg S ha\(^{-1}\) along with Soil test based NPK to rice in rice – lathyrus (butra) paira cropping system increases rice yield by 15.4% and butra yield by 11%.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Yield (kg ha(^{-1}))</th>
<th>Net return (Rs ha(^{-1}))</th>
<th>B:C ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>Rice (15.4%)</td>
<td>Butra (11.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3920</td>
<td>1590</td>
<td>67,661</td>
</tr>
<tr>
<td>Existing 60-30-30 kg N-P(_2)O(_5) K_2 O ha(^{-1}) to rice</td>
<td>3400</td>
<td>1260</td>
<td>55,953</td>
</tr>
</tbody>
</table>

**Action:** KVK Kalahandi, Nuapada

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**PLANT PROTECTION**

Around 33% of the crop output is lost due to attack by different insect-pests, weeds, diseases, rodents etc. To protect crop loss, farmers usually opt for chemical control measures which have several ill effects. To overcome such problems, integrated approach in pest management is the call of the day. Further, due to indiscriminate use of pesticides, any new pesticide that enters the market becomes obsolete in a short period. Therefore, search for new IPM fit pesticides are on through specific field and laboratory experiments. The recommendations emerging out from these experiments have been highlighted below and the technical programme for 2016-17 to solve some of the burning problems of farmers of Odisha have also been documented.

**Control of Insect Pests in Rice**

(a) New insecticide Belt Expert (Flubendiamide 240 SC + Thiacloprid 240 SC) 300 ml ha\(^{-1}\) applied at tillering and panicle initiation resulted in 89.6, 72.0, 66.4, 90.7, and 52.0% reduction of Silver Shoot, Dead Heart, White Ear Head, Brown Plant Hopper, Leaf Folder infestation with 65.5% yield improvement over control, as compared to .61.59, 62.24, 48.63, 76.54 and 60.06% with existing practice with Monocrotophos.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% Reduction of infestation over control (Mean of Kharif-2013, 2014, 2015)</th>
<th>% Yield improvement over control (Mean)</th>
<th>Additional Net Profit over control (Rs/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Silver Shoot</td>
<td>Dead Heart</td>
<td>White Ear Head</td>
</tr>
<tr>
<td>Flubendiamide 240 SC + Thiacloprid 240 SC (Belt Expert) 300 ml/ha</td>
<td>8 9.63</td>
<td>71.97</td>
<td>66.39</td>
</tr>
<tr>
<td>Monocrotophos 36 EC (Hilcron) 750 ml/ha</td>
<td>61.59</td>
<td>62.24</td>
<td>48.63</td>
</tr>
</tbody>
</table>

**Action:** OFT in all KVKs
(b) Flubendiamide 4% + Buprofezin 20% SC 875 ml/ha reduced dead heart (0.8%), BPH (11/10 hill) occurrence in rice compared to (12.8%, 11/10 hill) in control (monocrotophos) by effectively controlling rice stem borer and brown plant hopper and recorded highest grain yield of 4.2t/ha

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Stem borer (% DH) at 56DAT</th>
<th>76DAT</th>
<th>WEH (%)</th>
<th>Plant hoppers (72 DAT/10 hills)</th>
<th>Grain yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flubendiamide 4% + Buprofezin 20% SC 875 ml/ha</td>
<td>1.36 (1.36)</td>
<td>0.78 (1.12)</td>
<td>1.16 (1.28)</td>
<td>33.7</td>
<td>11.00</td>
</tr>
<tr>
<td>Monocrotophos (Suphos) 36 WSC @ 1390ml/ha</td>
<td>6.18 (2.58)</td>
<td>4.91 (2.32)</td>
<td>7.73 (2.86)</td>
<td>53.67</td>
<td>26.33</td>
</tr>
</tbody>
</table>

**Action**: OFT in KVKs having rice stem borer and BPH problem.

(c) Paddy seeds treated with Emamectin benzoate 5 SG 2 ppm a.i. (40.0 mg/kg seed) or Spinosad 45 SC 2 ppm a.i. (4.4 mg/kg seed) or deltamethrin 2.8 EC 1.0 ppm a.i. (0.04ml /kg seed), stored in moisture impervious bags provide safe storage up to 6-9 months in coastal region of Odisha retaining seed viability of 81-83 per cent.

**Action**: OFT in KVKs of coastal belts

**Control of diseases in Rice**

(d) Three sprayings with tank mixture of validamycin 2.5 ml/l and rynaxypyr 0.3 ml/l 10-15 days interval was effective for management of sheath blight disease, Stem borer and leaf-folder incidence in rice and recorded highest grain yield of 61.2 q/ha with 33.2% increase over control.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Dose</th>
<th>Sheath Blight severity %</th>
<th>Stem borer damage</th>
<th>Leaf folder damage</th>
<th>Grain Yield</th>
<th>% yield increase over control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Percent Disease Index (PDI)</td>
<td>Dead Heart %</td>
<td>WEH%</td>
<td>% DL</td>
<td>q/ha</td>
</tr>
<tr>
<td>Validamycin 3% L + Rynaxypyr 18.5% SC</td>
<td>2.5ml/l + 0.3ml/l</td>
<td>5.74 (13.84)</td>
<td>1.98 (1.71)</td>
<td>1.95 (1.69)</td>
<td>3.77 (2.18)</td>
<td>61.2</td>
</tr>
<tr>
<td>Control</td>
<td>36.11 (36.91)</td>
<td>17.70 (4.32)</td>
<td>15.90 (4.11)</td>
<td>20.22 (4.61)</td>
<td>45.8</td>
<td>-</td>
</tr>
</tbody>
</table>

**Action**: OFT in KVKs where both Sheath blight and Stem borer is a problem
(e) Three foliar sprayings of Azoxystrobin 1.0 ml/lit of water at 10 days interval starting with panicle initiation stage is effective in reducing the sheath rot disease incidence of rice by 78.6% and 71.2% as compared to Propiconazole 0.1% (existing practices).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Percent disease index</th>
<th>Percent efficacy of disease control</th>
<th>Yield (q/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azoxystrobin 0.1%</td>
<td>10.56 (18.94)</td>
<td>78.6</td>
<td>48.81</td>
</tr>
<tr>
<td>Propiconazole 0.1%</td>
<td>14.26 (22.18)</td>
<td>71.2</td>
<td>47.68</td>
</tr>
</tbody>
</table>

**Action:** OFT in KVKs having sheath rot disease problem of rice

(f) Novel insecticide Rynaxypyr 150 ml/ha combined with fungicide (Carbendazim 12% + Mancozeb 63%) 75 WP 2.0 g/l 15, 45 and 66 days after transplanting controlled rice stem borer and blast disease without any phytotoxicity in crops.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Stem borer (% DH) 55DAT</th>
<th>Stem borer (% DH) 76DAT</th>
<th>WEH (%) 55DAT</th>
<th>WEH (%) 76DAT</th>
<th>Plant hoppers (72 DAT/10 hills) 55DAT</th>
<th>Plant hoppers (72 DAT/10 hills) 76DAT</th>
<th>Blast severity (%) 66 DAT</th>
<th>Blast severity (%) 76 DAT</th>
<th>Grain yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rynaxypyr 20 SC 0.30 ml/l + Carbendazim plus mancozeb 75 WP 2.0 g/l</td>
<td>2.2 (1.62)</td>
<td>0.80 (1.13)</td>
<td>0.97 (1.20)</td>
<td>37</td>
<td>21</td>
<td>1.22 (1.31)</td>
<td>0.76 (1.12)</td>
<td>4.80</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>9.95 (3.23)</td>
<td>12.59 (3.62)</td>
<td>11.35 (3.42)</td>
<td>81</td>
<td>104</td>
<td>3.42 (1.98)</td>
<td>4.25 (2.18)</td>
<td>2.35</td>
<td></td>
</tr>
</tbody>
</table>

**Action:** OFT in KVKs having both rice stem borer and Blast problem

(g) New combination insecticide (Flonicamid + Fipronil) 30 SC 400g a.i./ha applied 35 and 50 days after transplanting gave excellent control of rice stem borers, leaf-folders and planthoppers resulting B:C of 1.89 as against check 1.17. This new insecticide proved better than Flonicamid, Fipronil alone and Thiamethoxam as check.

**Action:** OFT in KVKs of coastal odisha
(h) **Control of Disease complex in Groundnut**

Seed treatment with Tebuconazole 1.5 g/kg followed by furrow application of *Trichoderma viride* 4kg enriched in 50kg FYM/ha as basal application + broadcasting of *T. viride* 4kg enriched in 250kg FYM/ha 40 DAS + two sprays of Tebuconazole 1ml/lit. at 15 days interval starting from initiation of foliar diseases effectively controlled leaf spot, rust and collar rot in groundnut over existing practice. Tebuconazole 1.5g/kg seed + two spray of Tebuconazole 1ml/L at 15 days interval.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Leaf spot (%)</th>
<th>Rust (%)</th>
<th>Collar Rot (%)</th>
<th>Pod Yield (Kg ha⁻¹)</th>
<th>B:C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tebuconazole 1.5 g/kg followed by furrow application of <em>Trichoderma viride</em> 4kg enriched in 50kg FYM/ha as basal application + broadcasting of <em>T. viride</em> 4kg enriched in 250kg FYM/ha 40 DAS + two spray of Tebuconazole 1ml/L, 15 days interval</td>
<td>20.74 (27.03)</td>
<td>20.72 (26.98)</td>
<td>1.85 (7.77)</td>
<td>1710</td>
<td>1.90</td>
</tr>
<tr>
<td>Seed treatment with Tebuconazole 1.5g/kg seed + two spray of Tebuconazole 1ml/L 15 days interval</td>
<td>22.34 (28.17)</td>
<td>18.32 (25.19)</td>
<td>3.32 (10.50)</td>
<td>1617</td>
<td>1.81</td>
</tr>
</tbody>
</table>

**Action:** OFT in KVKs in groundnut growing areas

(i) **Control of Diseases in Jute**

Seed treatment with *Azotobacter, Trichoderma viride, PSB* each 5g/kg followed by soil application of *T. viridae* 2 kg/ha 21 DAS and *Pseudomonas fluorescens* spray 0.2% 45 DAS to control root rot and stem rot disease in Jute.

**Action:** OFT in KVKs in jute growing areas

**Weed management**

Weed causes a reduction of yield to the tune of 18-27 % in transplanted rice (Annual report of AICRP-WM). In the majority of areas, the existing practice, removal of weed from the field is the manual method of weeding at 25 and 45 DAT in which 25-30 labourers are engaged for weeding per hectare in transplanted condition. Moreover timely availability of manual labours is a constraint in the present situation. Considering these facts application of herbicides both pre and post emergence is a good alternate option for the farmers
(j) **Weed management in Transplanted rice**

Pendimethalin 750g/ha pre-emergence spray followed by bispyribac sodium 25 g/ha post-emergence 25 days after transplanting was effective in controlling weeds in medium land transplanted rice resulting a net monetary return of Rs.21,507/ha as compared to pendimethalin alone (Rs.18,790 /ha).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Grain Yield (t/ha)</th>
<th>Weed Index (%)</th>
<th>Net Return (Rs/ha)</th>
<th>B:C ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pendimethalin (38.7 %SC)</td>
<td>3.71</td>
<td>17.69</td>
<td>18790</td>
<td>1.56</td>
</tr>
<tr>
<td>Pendimethalin (38.7% SC) fb bispyribac-sodium</td>
<td>4.68</td>
<td>7.93</td>
<td>21507</td>
<td>1.70</td>
</tr>
</tbody>
</table>

**Action:** OFTs in all KVKs.

(k) **Weed Management in Blackgram**

The yield loss due to weeds ranges from 27-35 % in Odisha condition. Farmers in general don’t adopt any weed control measures to manage their weeds in pulses. Some good efficient molecules of ready mix combinations have been developed to tackle the weeds which are very economical in terms of yield advantage and labour savings.

Imazethapyr(2%) + pendimethalin(30%) (Ready mix) 1000 ml/ha pre-emergence spray is effective for controlling the weeds in *rabi* black gram. This treatment has a net monetary return of (Rs. 23,590 )over the existing practice of two manual weedicings (Rs.21,650).

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Weed densities (no/m²)</th>
<th>Weed biomass (g/m²)</th>
<th>Yield (t/ha)</th>
<th>B: C</th>
<th>NMR (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imazethapyr+pendimethalin (RM) @ 1000 g/ha PRE</td>
<td>164</td>
<td>61</td>
<td>1.22</td>
<td>2.21</td>
<td>23,590</td>
</tr>
<tr>
<td>Hand weeding(2) (20,40 DAS)</td>
<td>232</td>
<td>74</td>
<td>1.28</td>
<td>2.02</td>
<td>21,650</td>
</tr>
</tbody>
</table>

**Action:** OFTs in KVK Nayagarh,Balasore,Jagatsingpur,Kendrapada and Ganjam-I & II

(l) **Weed Management in Linseed**

Pre-emergence spray of pendimethalin 1 kg /ha + one HW 20 days after sowing effectively controls the weeds in linseed compared to pendimethalin alone.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Weed dry weight, g/m²</th>
<th>WCE (%) 60 DAS</th>
<th>Yield (kg/ha)</th>
<th>Gross Return (Rs./ha)</th>
<th>BC ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pendimethalin 1 kg/h a PE</td>
<td>199.8</td>
<td>61.4</td>
<td>704.5</td>
<td>28180</td>
<td>1.67</td>
</tr>
<tr>
<td>Pendimethalin 1 kg/ha PE + one HW 20 DAS</td>
<td>142.1</td>
<td>71.1</td>
<td>756.1</td>
<td>30244</td>
<td>1.52</td>
</tr>
</tbody>
</table>

**Action:** OFT in KVK Sundargarh I & II, Mayurbhanj I & II, Nuapada and RRTTS Keonjhar

(m) **Weed Management in Jute**
Quizalofop ethyl 60g/ha+ sticker 1ml/litre of water 15 days after Emergence +1 hand weeding 20 days after herbicide application effectively controls weeds in jute

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Fibre yield (q/ha)</th>
<th>WCE (%)</th>
<th>Net Return (Rs/ha)</th>
<th>B:C Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizalofop ethyl 60 g/ha + sticker 1 ml/l at 15 DAE + 1 HW 15-20 days after herbicide appln.</td>
<td>29.4</td>
<td>78.5</td>
<td>46218</td>
<td>2.17</td>
</tr>
<tr>
<td>Two hand weeding 15-20 &amp; 35-40 days after Emergence (DAE)</td>
<td>27.4</td>
<td>78.7</td>
<td>41894</td>
<td>1.99</td>
</tr>
</tbody>
</table>

Action: JRS Kendrapada and KVK Kendrapada

**HORTICULTURE**

Horticulture is the fastest growing sector within the agriculture and contributes immensely to poverty alleviation, nutritional and livelihood security and have ample scope for farmers to increase their income and helpful in sustaining large number of agro-based industries which generate enormous employment opportunities. Therefore, horticulture is set to assume a greater role and importance within the agriculture sector and eventually in the national economy in general and state economy in particular as Odisha has vast potential for exploiting horticulture. To make horticulture a more profitable venture, location and crop specific problem oriented research is very important. Following are some of the technologies developed through research works conducted by AICRPs and students’ research.

(a) **Variety replacement for higher yield in Potato**

Potato varieties such as Kufri Khyati (209.1 q/ha) and Kufri Ashoka (192.9 q/ha) of 60 days, and Kufri Puskar (262.3 q/ha) and Kufri Khyati (256.3 q/ha) of 75 days duration are recommended for Odisha as these short duration varieties exhibited significantly higher yield over the ruling variety Kufri Jyoti which is of longer (more than 80 days) duration causing more vegetative growth and less yield under Odisha situation.

Action: OFT in KVK Bhadrak, Jajpur, Sundargarh and RRTTS Keonjhar

(b) **Micronutrient Foliar Spray for Higher Yield in Banana**

In banana cv. Grand Naine, foliar sprays of micronutrients like ZnSO₄ 0.5% + FeSO₄ 0.5% + CuSO₄ 0.2% + H₃BO₃ 0.1% at 3rd, 5th and 7th months after planting in addition to recommended doses of NPK is recommended for higher growth and yield (62.98 t/ha) with an increase of 32% over control (47.7t/ha) without micronutrients.

Action: OFT in KVKs Puri, Jajpur, Bhadrak, Balasore, Ganjam I and II

(c) **Control of Cashew Stem and Root Borer(CSRB) for Higher yield in Cashew**
Phyto sanitation followed by mechanical extraction of Cashew Stem and Root Borer (CSRB) grub followed by application (mopping) of chlorpyriphos (0.2% solution) on the affected portion will effectively check the infestation of CSRB in cashew plantation.

**Action:** OFT in KVK Dhenkanal, Ganjam I & II, Gajapati, Jajpur, Keonjhar, Mayurbhanj I & II, Nayagarh, Rayagada and Koraput

(d) **Control of Tea Mosquito Bug in Cashew**

Spraying with Lambda cyhalothrin (0.6ml/l water) - Profenophos (2ml/l of water) - Lambda cyhalothrin (0.6ml/l water) at 15 days interval starting from flushing effectively manage the problems of Tea Mosquito Bug (TMB) and other associated insect pests in cashew. This will check 92.3% incidence of TMB and other insect pest and cause yield increase of 52% over control.

**Action:** OFT in KVK Dhenkanal, Jajpur, Keonjhar, Mayurbhanj I & II, Nayagarh, Ganjam I & II, Gajapati, Rayagada and Koraput

(e) **Use of Poly shade Net for Cultivation of Lilium**

Cultivation of *Lilium* cv. Black Out, Nashville, Fangio, Pavia and Tresor are suitable for cultivation under Poly shade net structures of KVKs as well as the unutilized green houses of our state. Profit of Rs.1.00 lakh and 2.00 lakh may be obtained from 500m² area of newly constructed or existing polyshade net structures respectively.

**Action:** OFT in KVK Koraput, Sambalpur, Sundargarh-II, Angul, Dhenkanal, Puri and Ganjam-II

**AGRICULTURAL ENGINEERING**

Since, there has been a sharp increase in migration of agricultural labour force to the non-agricultural sector, the labour cost has been increased many folds, availability of farm labour during peak hours is a serious concern. Obviously, the
Demand of R&D activities on development of various improved agricultural implements for different field operations suitable for human, animal, tractors and power tillers are therefore on rise. The Department of Farm Machinery and Power in College of Agricultural Engineering and Technology is engaged in this directions through student research and three ICAR funded AICRPs like Farm Implement & Machinery, Ergonomics and Safety in Agriculture and Utilization of Animal Energy where design development and modifications of the implements are being carried out.

FARM MACHINERY

(a) Three Row Rice Transplanter

- Three row rice transplanter has been developed for female agricultural workers of Odisha
- Suitable for small and marginal farmers having small field size
- Output: 160 sq m per hour compared to 60 sq m per hour in manual random transplanting
- Reduces drudgery
- Cost of transplanting operation is Rs 1130/- per acre as compared to Rs 4000/- per acre in manual transplanting; thus reduces Rs 2870/- per acre for transplanting.
- Cost: Rs 8,000/-
- Recommended for demonstration through KVKs

(b) Tractor Operated Multi-Crop Seed Cum Fertilizer Drill for Direct Seeding Of Rice (DSR)

- Suitable for line sowing of different seeds under upland and medium land situations.
- Direct seeding of rice is found more profitable over local method of transplanting.
- Capacity: 1.5 h/ac
- Seed rate: 14 kg/ac (Paddy)
- Row spacing: Adjustable
- Cost: Rs 60,000/-
- Saving of 16 kg of seed per acre
- Cost of sowing is Rs 1200/- per acre as compared to Rs 4000/- per acre for transplanting; thus saving Rs 2800/- per acre in cost of sowing operation
- Available to farmers of the state with subsidy
- Recommended for frontline demonstration through KVKs

(c) Self Propelled 8-Row Rice Transplanter
Suitable for line transplanting under medium land and low land situations.
- Output: 2.5 h/acre
- Spacing: 23.8 cm x 14/16/18 cm
- Cost: Rs 1,97,000/-
- Saving of 16 kg of seed per acre
- Cost of transplanting operation is Rs 2187/- per acre as compared to Rs 5500/- per acre in manual line transplanting; thus reduces Rs 3313/- per acre for line transplanting.
- Available to farmers of the state with subsidy
- Recommended for frontline demonstration through KVKs

(d) **Tractor Operated Groundnut Thresher**

- Threshing of groundnut pods can be done in the field itself without transporting to the threshing yard.
- Cost: Rs 1,60,000/-
- Output: 550 kg/h
- Threshing efficiency: 98.00%
- Cost of threshing is Rs 160/- per q as compared to Rs 440/- per q in manual hand picking method; thus reduces Rs. 280 per quintal of pod for threshing.
- Available to farmers of the state with subsidy
- Recommended for frontline demonstration through KVKs

(e) **Bullock Drawn 8 Row Drum Seeder**

- Suitable for line sowing of pre-germinated paddy seeds under wet land paddy cultivation system.
- Better precision due to falling of seeds on the ridges.
- Reduced cost of operation and labour requirement as compared to conventional line transplanting
- Cost: Rs13,500/-
- Actual field capacity: 2.5 hrs/acre
- Field efficiency: 68.25%
- Cost of operation is Rs249/- per acre as compared to Rs 4000/- per acre for manual transplanting; thus saves Rs 3751/- per acre for wet land paddy establishment method.
- Available to farmers of the state with subsidy
- Recommended for frontline demonstration through KVKs
POST HARVEST TECHNOLOGY

(f) Manual Mahua Seed Decorticator

• Efficiency: Output 10kg/h compared to 5 kg/h in manual hand decortication
• Suitability: Suitable for Tribal farmers
• Advantage: Saving in cost Rs 120/- per q, Drudgery reduction

(g) Power Operated Mahua Stamen Remover
(1.0 hp single phase electric motor)

• Efficiency: Output 20 kg/h compared to 3 kg/h in manual method
• Suitability: Suitable for Tribal farmers
• Advantage: Saving in cost Rs 240/- per q, Drudgery reduction.

SOIL AND WATER CONSERVATION ENGINEERING

At present times, the natural resources like soil and water are degrading at a much faster rate than ever before due to human interference. For attainment of sustainable food and nutritional security in the state, there is an urgent need to adopt different appropriate soil and water conservation measures on watershed basis. In this context, the discipline of Soil and Water Conservation Engineering plays a significant role in imparting adequate knowledge in the field of soil erosion control, moisture/water conservation, land grading and development, irrigation, ground water development and wells, agricultural drainage and watershed management, which are barely required for sustainable agricultural and ecological development. Following are some of the research based technologies which are useful for sustainable crop production.
(h) **Optimization of Design Dimensions of Contour Bund**

<table>
<thead>
<tr>
<th>Land type</th>
<th>Design dimension</th>
<th>Advantage</th>
</tr>
</thead>
</table>
| Arable upland   | Top width = 0.45 m  
                 Base width = 3.57 m  
                 Height of bund = 1.04 m  
                 Side slope = 1.5:1 (horizontal: vertical) with vertical interval and horizontal intervals of 1.53 and 30.5 m respectively |
|                 | Dimensions of the rectangular surplus weir  
                 Depth of weir = 0.25 m  
                 Length of weir = 1.82 m. | Increase in soil moisture content and ground water table. Decrease in soil & water erosion. Increase in yield of crop |
| Arable medium Land | Top width = 0.45 m  
                 Base width = 2.20 m  
                 Height of bund = 0.58 m  
                 Side slope = 1.5:1 (horizontal: vertical) with vertical interval and horizontal interval of 0.96 and 91.5 m, respectively.  
                No surplus weir is required in the contour bund. |                                                                                                                                 |

(i) **Optimization of Pond Area and Design Dimension for Rice-Mustard Cropping System in Watershed**

<table>
<thead>
<tr>
<th>Cropping system</th>
<th>Pond area and design dimension</th>
<th>Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice-mustard</td>
<td>14.2% of crop area should be used for unlined farm pond in low land in the watershed with side slope 1:1 and depth of pond as 3m.</td>
<td>Decrease in soil &amp; water erosion. Increase in yield of crops</td>
</tr>
</tbody>
</table>

**VETERINARY SCIENCE AND FISHERY TECHNOLOGY**

A total of 55 experiments were conducted in various aspects of the livestock and poultry to improve the production, reproduction, disease diagnostics and healthcare which resulted from the research activities of 3 AICRPs, 6 externally funded projects and 55 departmental projects, out of which 47 number of experiments culminated by the end of 2015-16. After thorough deliberations done at multiple level (TRG and TAG) the following five technologies were recommended for further dissemination to the farmers through the KVKs of the University.

(a) Teat dipping in 5% *Curcuma longa* solution for five minutes after each milking and oral administration of dicalcium phosphate 25 gm daily for 90 days prevent occurrence of subclinical mastitis.
Importance:

Mastitis is a serious problem in the dairy cattle of the state. Efforts have been made to control it through different methods at farmers level. It has been found that teat dipping with 5% (W/V) *Haldi* solution (*Curcuma longa*) for five minutes after each milking and oral administration of Dicalcium Phosphate powder 25 gms for 90 days, prevents subclinical mastitis which can be adopted by the farmers as a routine practice.

(b) Trace mineral (Fe, Cu and Zn) mix in a defined proportion in conjunction with galenicals addresses delayed maturity and anestrous problems in dairy cattle. Trace mineral (Fe, Cu and Zn) mix in a defined proportion of 2:2:1 1 gm/day for 15 days orally along with tamponing of cervix and vagina with Lugol’s Iodine 6% for three occasions at an interval of 3 days can bring ovulatory estrus in delayed matured heifers and anestrous cattle.

Importance:

i. Cheap technology adoptable by farmers. Technology Sustainable if the line Department. Will supply the TRACE MIN in bulk to the field.
ii. Farmer’s benefit: Low cost treatment for early maturity of CB heifers with high economic benefit.

(c) Herbal management of fluorosis in cattle with tamarind pulp and Moringa powder

Fluorosis in cattle and buffalo is a serious problem in industrial areas of the state. Herbal remedy of fluorosis in cattle with the Tamarind pulp 100 g/day/cow and Moringa powder 50g/day/cow can be used for enhancing production, workability and economic value of fluorotic cattle.

Importance:

i. Cheap technology adopted and prepared by farmers
ii. Low cost treatment for enhancing production and productivity by reducing the deleterious effect of fluorides

(d) Newly Developed Coloured Meat type Pallishree Poultry Bird for Back Yard Rearing

The newly developed meat type “Pallishree” poultry bird which is very popular amongst farming community practicing back yard rearing. Since the infrastructural facility for producing huge number of day old chicks to cater the demand of the farmers, is meagre, the state Govt. or its authorized Institutions can receive the parent chicks from OUAT poultry project for its propagation and supply to farmers in the field.
Importance:

i. As there is public demand for coloured broiler bird in the market, the farmer can fetch good price for the Pallishree bird which is suitable for rearing in the back yard.
ii. Can be reared year round for more profit.

(e) Treatment of Chronic Repeat Breeding Cows with Nutritional and Hormonal Intervention for High Conception Rate

Repeat breeding is a major reproductive problem of dairy cattle. To control this syndrome of varied causes, a Comprehensive Therapeutic Module with multiple treatment approach has been found to provide promising result, which can be passed on to farmers and field vets.

The module is as follows:

i. Area Specific Mineral Mixture- 50 gms/day for 2 months.
ii. Deworming with Fenbendazole- 1-5-3.0 gms
iii. Uterine lavage with Normal Saline-30-50 ml in first estrus
iv. Adoption of double Synch hormonal Protocol (PG, GnRH, PG and GnRH on Day 0, 2, 9 and 11 respectively) after 10-15 days of uterine lavage, followed by Fixed Time Insemination (Day 12 & 13).
v. High incidence of repeat breeding in the field is affecting production, reproduction and farmers economy. The present comprehensive treatment module for repeat breeders will be highly beneficial. Treatment with high success rate will economize dairy husbandry.

FISHERY SCIENCE

(f) Nutritional enhancement of oil cakes through microbial fermentation with 5% probiotic, 25% jaggery and vegetable waste as diet increased the growth of striped cat fish, angasianodon hypophthalmus

ALLIED SCIENCES

(a) Mushroom a remunerative enterprise

Odisha stands in second position with respect to total mushroom production in the country with 15, 986 t/ year.

i. Oyster mushroom variety, Pleurotus pulmonarius (Indian oyster) is suitable for cultivation in the inland districts of the state during the winter season with the yield potential as high as 120%.
ii. Two strains of Volvariella volvacea namely, OSM 11 & 12 have been identified for higher yield potential and are being tested in national trials across the country.
(b) **Honeybee**

Method of scientific beekeeping of *Apis cerena indica* has been standardised for Odisha with respect to

i. Site selection, Colony Installation,

ii. Bee equipments-Specificity,

iii. Colony production (Divided colony), Colony capture (Natural and Swarm) technique,

iv. Management technique for summer, Rainy and winter season

v. Management of Natural enemies – Wax moth, Mites, Ants

vi. Honey Extraction, Wax extraction