
















**Directorate of Research**  
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**(Research Recommendations released during the year 2023-2024)**




**Research Accomplishments and Recommendations-2024**

**A) Varieties/Hybrids released**

S.N.	Released Variety/Hybrid	Salient features	Photo
1.	Chikpea : PDKV super JAKI ( AKG – 1402 )	<ul style="list-style-type: none"> <li>➤ Yield – 20.73 q/ha .</li> <li>➤ Maturity – 98 days</li> <li>➤ Early and Synchronous Maturity.</li> <li>➤ Bold seeded</li> <li>➤ Suitable for Mechanical Harvesting.</li> <li>➤ Resistant to moderately resistant for wilt disease.</li> </ul>	 
2.	Rice : PDKV Sakshi ( SKL-10 -15- 593 - 162 - 25 - 106 – 70 )	<ul style="list-style-type: none"> <li>➤ Average yield – 44 q/ha</li> <li>➤ Early duration – 120 days</li> <li>➤ Long slender grains, with good cooking and eating quality, dwarf stature non lodging .</li> <li>➤ Nutritionally enriched ( Zinc -25 ppm and Iron 10 ppm ) in polished rice.</li> <li>➤ Moderately resistant to stem bores, blast and glume discolouration.</li> </ul>	  

3.	Mustard: PDKV Kartik (ACN237)	<ul style="list-style-type: none"> <li>➤ Seed yield – 15 kg/ha.</li> <li>➤ Oil content – 40.32%.</li> <li>➤ More siliquae density on main stem and seeds per siliqua.</li> <li>➤ Comparable with checks for Aphid and Powdery Mildew Reaction.</li> </ul>	 
4.	Safflower: PDVK white ( AKS 351 )	<ul style="list-style-type: none"> <li>➤ High yielding potential of 18 – 22 q/ha .</li> <li>➤ Oil content 28-33%.</li> <li>➤ Medium to late duration and matures in 136 – 140 days .</li> <li>➤ Boldness and bright white colour of seed .</li> <li>➤ Tolerant to aphid and moderately resistant to Alternaria leaf spot.</li> </ul>	 
5.	Little Millet: PDKV Tejashree (BLM – 18-21)	<ul style="list-style-type: none"> <li>➤ Yield - 22.63 q/ha .</li> <li>➤ Medium to late maturity.</li> <li>➤ For kharif season in Maharashtra.</li> <li>➤ Tolerant to major pest and disease.</li> </ul>	 
6.	Gladiolus genotype PDKV Satpuda Parpul (NG-6)	<ul style="list-style-type: none"> <li>➤ More spike yield (2.77 lakh per ha)</li> <li>➤ More number of corms (2.59) per plant</li> <li>➤ Attractive purple petals with dark violet streaks in throat on lower petals</li> <li>➤ Long straight spike (105.80 cm)</li> <li>➤ More number of florets (15.50) per spike</li> <li>➤ More vase life (10.38 days)</li> <li>➤ Moderately resistant to fusarium wilt disease.</li> </ul>	 

### B) Released Farm implements/machineries

S.N.	Released implement/machinery	Salient features	Photo
1	Tractor operated turmeric harvester	<ul style="list-style-type: none"> <li>The developed turmeric harvester is suitable for digging turmeric rhizomes from raise beds</li> <li>Digging efficiency of this equipment is 98.52 %</li> <li>Saving in labor and time</li> <li>Strong and durable construction</li> <li>Ease in operation</li> </ul>	
2	PDKV developed small tractor operated machine for production of pellets.	<ul style="list-style-type: none"> <li>Agro residues such as soybean straw and cotton stalks can be used to produce pellets of 15 mm diameter</li> <li>The capacity of machine is 50 kg/h.</li> <li>Small tractor (18 -28 hp) is sufficient to operate feeding, mixing and pelleting mechanisms of pelleting machine.</li> <li>Bulk density and calorific value of pellet is improved compare to agro-residue.</li> <li>The pellets can be used in improved cook stove .</li> </ul>	
3	PDKV developed tractor drawn subsoiler attachment to rotavator	<ul style="list-style-type: none"> <li>Used to break the hard pan formed beneath the soil surface by the continuous use of the rotavator.</li> <li>The depth of operation of subsoiling can be varied from 23 to 45 cm.</li> <li>There is 58% saving over the cost of operation due to combined operation.</li> <li>Time saving is about 48% due to combined operation.</li> </ul>	

### c) Research Recommendations- (72)

<b>A</b>	<b>Agricultural Botany</b>																				
1.	To prepare good quality herbal tea from butea (Palas) monosperma flower, it is recommended to use 60% dried flowers with 20% Artesimia (Dawana), 10% fennel seed, 10% Mulethi (Jeshthamadh) or use 60% dried flowers with 20% fenugreek seed, 5% cinnamon, 10% Mulethi (Jeshthamadh) and 5% cardamom.																				
2.	It is recommended to use 50 percent grape pulp or pomegranate juice to prepare value added fermented beverage from butea (Palas ) flower.																				
<b>B</b>	<b>Natural Resource Management</b>																				
<b>i</b>	<b>Agronomy</b>																				
3	For higher yield of rainfed cotton the sowing should be done after the onset of monsoon with receipt of adequate rainfall (75 mm to 100 mm) in Vidarbha region, late sowing (10 to 15 July) will result in 24% reduction in yield.																				
4	Application of 275:125:125 kg NPK ha <sup>-1</sup> {with three split application as Basal 40:65:65 (14%N+50%P+50%K), after 8-10 weeks 160:0:0 (57.5%N) and at final earthing up i.e. 16-18 weeks 75:60:60 (28.5%N+50%P+50%K) kg NPK} is recommended for higher yield and economic return from Suru Sugarcane in Vidarbha region.																				
5	Transplanting of Paddy with application of recommended dose of fertilizer (100:50:50 Kg/ha, NPK) by Paddy transplanter at Spacing of 30 x 12 cm is recommended for higher grain yield and economic returns.																				
6	Three spraying of anacardic acid as a biostimulent @4mg/litre +Dimethyl Sulphoxide 0.5 ml/litre at 30,45 and 60 days after sowing is recommended for higher seed cotton yield and monetary returns in Bt cotton.																				
7	In cotton-based cropping system, for obtaining higher system productivity and monetary returns, it is recommended to grow chickpea or wheat (late sown variety) as a sequence crop after early Bt hybrids (140-150 days) in <i>kharif</i> with 100 percent RDF to rabi crops grown in sequence.																				
8	For obtaining higher grain, straw yield and economic returns of foxtail millet, sowing at 45 X 10 cm with application of 0:25:25 kg/ha NPK is recommended.																				
9	Sowing of midlate Bt cotton hybrid (BG-II) with 125 % recommended dose of N (150 Kg N) and K (75 Kg K) in four splits through fertigation (as given in table below with 75 Kg P as basal at sowing) and monopodia removal at 60 DAS and detopping at 75-80 DAS is recommended for higher seed cotton yield, water and nutrient use efficiency and monetary returns under drip irrigation.																				
	<table><tr><th>Quantity of fertilizer to be applied in four splits</th><th>No. of splits</th><th>Stage of Crop</th></tr><tr><td>20 % N &amp; K (30 Kg N+15 Kg K)</td><td>1<sup>st</sup></td><td>Sowing</td></tr><tr><td>30 % N &amp; K (45 Kg N+22.5 Kg K)</td><td>2<sup>nd</sup></td><td>30 DAS</td></tr><tr><td>30 % N &amp; K (45 Kg N+22.5 Kg K)</td><td>3<sup>rd</sup></td><td>60 DAS</td></tr><tr><td>20 % N &amp; K (30 Kg N+15 Kg K)</td><td>4<sup>th</sup></td><td>90 DAS</td></tr><tr><td>Total Splits</td><td>4</td><td></td></tr></table>			Quantity of fertilizer to be applied in four splits	No. of splits	Stage of Crop	20 % N & K (30 Kg N+15 Kg K)	1 <sup>st</sup>	Sowing	30 % N & K (45 Kg N+22.5 Kg K)	2 <sup>nd</sup>	30 DAS	30 % N & K (45 Kg N+22.5 Kg K)	3 <sup>rd</sup>	60 DAS	20 % N & K (30 Kg N+15 Kg K)	4 <sup>th</sup>	90 DAS	Total Splits	4	
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10	Sowing of ‘Mid-late duration <i>Bt</i> cotton - summer groundnut’ or ‘Early duration <i>Bt</i> cotton - chickpea’ cropping system is recommended for maximum yield and economic returns.																				
11	Intercropping of Chickpea + Mustard (6:1) or Chickpea + Mustard (5:2) is recommended for higher mustard equivalent yield and economic return.																				
12	In organic farming system following pulse based crop rotation and integrated nutrient management through organic sources to base crop of recommended dose of nutrients (50% RDNK through FYM + 25 % RDNK through Neem cake + 25% RDNK through Vermicompost top dressing) and P compensate through Phosphorus rich organic manure (PROM) is recommended for highest cotton equivalent yield, <i>in-situ</i> biomass yield, economics, system profitability, sustainable yield index, pest reduction and soil health. Spraying of botanicals (Dashparni ark @ 250 ml. in 10 lit. of																				



	water or 5% NSKE) and biopesticides (Beauveria and Metarhizium @ 40 ml in 10 liter of water) and erection of pheromone traps (5 per hectare) for pest management is recommended.				
	<b>First year</b>	<b>Second year</b>	<b>Third year</b>	<b>Fourth year</b>	<b>Fifth year</b>
	Blackgram – Chickpea	Cotton + Pigeonpea (3:1)	Pigeonpea + Blackgram (1:3)	Pigeonpea + Soybean (1:3)	Cotton + <i>in situ</i> green manuring of Sunhemp at 40 DAS (2:1)
	<b>OR</b>				
	Cotton	Pigeonpea + Soybean (1:3)	Cotton + <i>in situ</i> green manuring of Sunhemp at 40 DAS (2:1)	Sorghum + Greengram (1:2) - Chickpea	Cotton + Blackgram (2:1)
13	In organic farming system, for obtaining better quality, higher monetary returns and improving soil health through application of 50% RDNK through Vermicompost (6 t) + 50% RDNK through Neemcake (2 t/ha) + Biofertilizers or 50% RDNK through Vermicompost (6 t/ha) + 50% RDNK through FYM (17 t/ha) + Biofertilizers or 25% Vermicompost RDNK through (3 t/ha) + 25% RDNK through Jeevamrut (1000 litre @ 10% and remaining 2000 litre @ 20% at 15 days interval) + Biofertilizer + Green manure at 40 DAS and P compensate through Phosphorus rich organic manure (PROM) is recommended for turmeric. Spraying of botanicals (Dashparni ark @ 250 ml. in 10 lit. of water or 5% NSKE) and biopesticides (Beauveria and Metarhizium @ 40 ml in 10 liter of water) for pest management is recommended.				
14	Application of vermicompost 1.6 t/ha + seed treatment (Azotobacter 10ml/kg + PSB 10ml/kg + Trichoderma 6ml/kg) + Jeevamrut 500 L/ha (at 10, 20 and 30 DAS) or application of vermicompost 1.6 t/ha + seed treatment (Azotobacter 10ml/kg + PSB 10ml/kg + Trichoderma 6ml/kg) + Cowdung slurry 700 L/ha (at 10, 20 and 30 DAS) to spinach is recommended for getting higher yield, quality and monetary returns.				
15	In organic farming system intercropping of cotton + blackgram sown in 2:1 proportion at 60 cm spacing (mulching of black gram after plucking of pods) + with application of vermicompost @ 2.5 t ha <sup>-1</sup> before sowing + Jeevamrut 10% at 50 DAS and for pest management use of trap crop along with Trichocard @ 5 cards/ha 2 times and spraying with 5 % NSKE 250 ml/ 10 liter or Neem oil 5 ml/ liter of water, bio pesticide <i>Verticillium lecanii</i> @ 40ml/10 liter of water and collection and destruction of rosette flower is recommended for getting higher cotton equivalent yield and economic returns.				
<b>ii</b>	<b>Soil Science and Agril. Chemistry</b>				
16	Under long term (37 years) integrated nutrient management, for maintaining antecedent SOC at 6.5 g kg <sup>-1</sup> and available nitrogen 253 kg ha <sup>-1</sup> , it is recommended to incorporate 50% N (30 kg ha <sup>-1</sup> ) through Gliricidia green leaf manure (4 tons/ha) or FYM (6 tons/ha) alongwith remaining recommended 50% N (30 kg ha <sup>-1</sup> ), 100% P (30 kg ha <sup>-1</sup> ) and K (30 kg ha <sup>-1</sup> ) through chemical fertilizers to cotton + greengram (1:1) intercropping system for improvement in soil quality with sustainable system productivity and SOC storage to ensure around 77 kg ha <sup>-1</sup> increase in system productivity for each 1 Mg ha <sup>-1</sup> increase in SOC stock in semi-arid Vertisols.				
17	For obtaining good quality, higher yield and monetary returns of garlic bulbs in medium deep soil, application of 15 t FYM ha <sup>-1</sup> before planting and total fertilizer dose of 80: 40: 40: 32 NPKS ha <sup>-1</sup> should be applied, out of which 24: 16: 12: 16 kg ha <sup>-1</sup> NPKS as basal dose and remaining nutrients in 7 splits through drip fertigations @ 8 : 3.4 : 4.0 : 2.3 kg ha <sup>-1</sup> NPKS through water soluble				

	fertilizers after 15 days of planting at 12 days interval is recommended.																																																																																		
18	In global warming era, in order to mitigate the GHG emission from Integrated Farming System based agriculture sector, it is recommended that, in the 1.00 ha of irrigated IFS model, all the crop residues should be recycled in situ and the system should include suitable horticultural fruit crop on at least 0.25 ha and plantation of suitable forest multipurpose tree species (MPTS) on border of farm for adequate negative balance i.e. carbon credit of GHG emission.																																																																																		
19	The application of 100% RDF along with PDKV enriched NPS compost @ 2.5 tonnes ha <sup>-1</sup> and 4 foliar sprays of 1% humic acids at flowering, fruit setting, after first and second picking is recommended for higher yield and quality of brinjal with improvement in soil fertility and higher economic returns.																																																																																		
<b>C</b>	<b>Horticultural Crops</b>																																																																																		
<b>i</b>	<b>Fruit Science</b>																																																																																		
20	For preparation of jamun bar, cooking of fruit pulp mixed with stevia powder till achieved 30 <sup>0</sup> B TSS is recommended.																																																																																		
21	For preparation of mandarin jam, in 1 Kg mandarin juicy vesicles addition of 650 g of sugar is recommended.																																																																																		
22	Foliar sprays of 15 ppm GA3 (Gibberellic acid) along with 15 ppm CPPU (Forchlorfenuron) or 2 ppm brassinolide, at initiation of flowering and pea size fruit stage is recommended for reduction of fruit drop, higher yield and more economic returns from mandarin in mrig bahar.																																																																																		
<b>ii</b>	<b>Vegetable Science</b>																																																																																		
23	For obtaining higher yield with better monetary return of turmeric, it is recommended to use soybean straw as mulch and apply 80% of RDF i.e 160:80:80 NPK, Kg/ha of soluble fertilizer through drip irrigation in 30 equal split at 5 days interval.																																																																																		
24	For obtaining higher onion seed yield, quality and monetary return, use of 30 micron thick, silver colour polyethylene mulch or use of organic mulch (soybean straw) along with 90% replenishment of irrigation water is recommended.																																																																																		
25	For obtaining higher marketable bulb yield and quality of onion, it is recommended to adopt drip system of irrigation and fertigation dose of 80:40:40:24 kg NPKS/ha along with 11 splits at 6 days interval should be applied as per below table.																																																																																		
	<table><tr><th rowspan="2">Split No</th><th rowspan="2">Days after planting</th><th colspan="4">Water soluble fertilizers to be applied through drip irrigation (Kg/ha)</th></tr><tr><th>N</th><th>P</th><th>K</th><th>S</th></tr><tr><td>1</td><td>15</td><td>8.0</td><td>4.0</td><td>4.0</td><td>2.40</td></tr><tr><td>2</td><td>21</td><td>12.0</td><td>4.8</td><td>5.2</td><td>2.88</td></tr><tr><td>3</td><td>27</td><td>12.0</td><td>4.8</td><td>5.2</td><td>2.88</td></tr><tr><td>4</td><td>33</td><td>12.0</td><td>4.8</td><td>5.2</td><td>2.88</td></tr><tr><td>5</td><td>39</td><td>12.0</td><td>4.8</td><td>5.2</td><td>2.88</td></tr><tr><td>6</td><td>45</td><td>8.0</td><td>4.4</td><td>3.2</td><td>2.88</td></tr><tr><td>7</td><td>51</td><td>5.6</td><td>4.4</td><td>3.2</td><td>2.40</td></tr><tr><td>8</td><td>57</td><td>5.6</td><td>4.0</td><td>3.2</td><td>2.40</td></tr><tr><td>9</td><td>63</td><td>4.8</td><td>4.0</td><td>3.2</td><td>2.40</td></tr><tr><td>10</td><td>69</td><td>0.0</td><td>0.0</td><td>1.2</td><td>0.00</td></tr><tr><td>11</td><td>75</td><td>0.0</td><td>0.0</td><td>1.2</td><td>0.00</td></tr><tr><td></td><td>Total</td><td>80.0</td><td>40.0</td><td>40.0</td><td>24.00</td></tr></table>	Split No	Days after planting	Water soluble fertilizers to be applied through drip irrigation (Kg/ha)				N	P	K	S	1	15	8.0	4.0	4.0	2.40	2	21	12.0	4.8	5.2	2.88	3	27	12.0	4.8	5.2	2.88	4	33	12.0	4.8	5.2	2.88	5	39	12.0	4.8	5.2	2.88	6	45	8.0	4.4	3.2	2.88	7	51	5.6	4.4	3.2	2.40	8	57	5.6	4.0	3.2	2.40	9	63	4.8	4.0	3.2	2.40	10	69	0.0	0.0	1.2	0.00	11	75	0.0	0.0	1.2	0.00		Total	80.0	40.0	40.0	24.00
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<b>iii</b>	<b>Floriculture</b>																																																																																		
26	Application of recommended dose of fertilizer (300:200:200 N,P,K Kg per ha), 50% (150:100:100 N,P,K Kg/ha) as a basal dose and 50% (150:100 :100 N,P,K Kg/ha) through water soluble fertilizer in eight equal splits from 20DAP at 10 days interval is recommended for obtaining better quality flower spikes and more number of corms and cormels in Gladiolus.																																																																																		

27	For obtaining higher flower yield and monetary returns, planting of aster flower crop at 30 x 20 cm spacing and two spray of 1.0 percent calcium nitrate at 30 and 50 days after transplanting is recommended for Vidarbha region.
28	For commercial propagation of Bougainvillea, dipping of hardwood cuttings in IBA 2000 ppm concentration solution for five minutes is recommended.
29	For preparation of better-quality wine from rose ( <i>Rosa Centifolia</i> ) petal, inoculation of the must with <i>Saccharomyces cerevisiae</i> var. <i>ellipsoideus</i> @15 ml. per liter and maintaining 24° Brix total soluble solids is recommended.
<b>iv</b>	<b>Agroforestry</b>
30	Under rainfed cultivation protective irrigation of Bhaluka bamboo ( <i>Bambusa balcooa</i> ) and Manga Bamboo ( <i>Dendrocalamus stocksi</i> ) for higher bamboo biomass, number of bamboo pole production and monetary returns, it is recommended to apply the fertilizer dose 150:40:125 NPK gm per year clump (plant) during establishment phase (First to Fourth year).
<b>D</b>	<b>Animal Husbandry &amp; dairy Science.</b>
31	Feeding of 2 % common salt treated soybean straw in standard ration is recommended to maintain and improve the health and milk production of cows.
32	For the preparation of good quality value added kulfi by traditional method used 50% evaporated cow milk, 14 % crushed dried Mahua flowers and 13 % sugar by weight of mix is recommended
33	It is recommended that, use of 4 % Dragon fruit pulp and 40 % sugar in buffalo milk chakka for preparation of good quality value added shrikhand.
34	For preparation of good quality value added gulabjamun from cow milk khoa blending with 30 % matured unripe steamed banana pulp and 10 % wheat flour by weight of mix is recommended
<b>E</b>	<b>Plant Protection</b>
<b>i</b>	<b>Plant Pathology</b>
35	Application of Vermicompost @ 1.5 kg or compost @ 2 kg for 80 litres of water (0.1224 M <sup>3</sup> ) is recommended for getting better result for <i>Azolla</i> ( <i>Azolla microphylla</i> ) production.
36	For saving 25 per cent nitrogen dose in paddy crop, application in situ prepared <i>Azolla</i> ( <i>Azolla microphylla</i> ) @ 5 t /ha + 75 per cent recommended dose of nitrogen (50 kg N basal dose + 25 kg N as top dressing) is recommended.
37	For effective management of Mungbean leaf crinkle disease, seed treatment with Thiamethoxam 70 % WS @ 5 g/kg seed and spraying of Thiamethoxam 25 % WG @ 4 g/ 10 L of water at 21 <sup>st</sup> and 35 <sup>th</sup> days after sowing is suggested as research finding.
38	Application of fortified FYM with bio-decomposer (1kg / tree) and spraying of HMO @ 2% (200 ml/ 10 L water) in the months of July and August as a protective spray, as well as spraying of Hexaconazole 4% + Zineb 68% WP (combi product) @ 15 g/ 10 L water on the tree in November, is suggested as a research finding for integrated management of greasy spot of Nagpur mandarin.
39	Three spray of Potassium nitrate (1 kg) + pre-mixed fungicide Azoxystrobin 18.2% + Difenconazole 11.4% SC (100 ml) + GA3 (1 g) or Potassium nitrate (1 kg) + pre-mixed fungicide Tebuconazole 50% + Trifloxystrobin 25% WG (50 g) + GA3 (1 g) in 100 L water at first fortnight of April, August and September is suggested as research finding for effective management of ambia bahar fruit drop of Nagpur mandarin.
40	Two sprays of combi-fungicide, Azoxystrobin 18.2% + Difenconazole 11.4%SC @ (10 ml/10 L), first at initiation of disease and second at 15 days after first spray found effective for management of leaf blotch and leaf spot disease of Turmeric.
<b>ii</b>	<b>Entomology</b>
41	For effective management of stem borer and leaf folder and getting higher grain yield of rice crop, the below plant protection module is recommended. <ul style="list-style-type: none"> <li>• Soil application of Chlorantraniliprole 0.4 % GR @ 10 kg/ha at 10 days after transplanting.</li> <li>• Installation of pheromone traps (Scirpolure) @ 8/ha in field at 15 days after transplanting.</li> <li>• Three releases of <i>Trichogramma japonicum</i> @ 50,000 eggs/ha at 20, 30 and 40 days after transplanting.</li> </ul>

	<ul style="list-style-type: none"> <li>• Spraying of Azadirachtin 1500 ppm @ 40 ml/10 liter of water at 50 days after transplanting.</li> <li>• Spraying of Flubendiamide 39.35% m/m SC @ 1 ml/10 liter of water at 70 days after transplanting.</li> </ul>
42	<p>For effective management of stem borer and brown plant hopper and getting higher grain yield of rice crop, the below plant protection module is recommended.</p> <ul style="list-style-type: none"> <li>• Soil application of Fipronil 0.6 % GR @ 10 kg/ha at 30 days after transplanting.</li> <li>• Soil application of Chlorpyrifos 10 % GR @ 10 kg/ha at 45 days after transplanting.</li> <li>• Spraying of Carbosulfan 25 % EC @ 16 ml/10 liter of water at 60 days after transplanting.</li> <li>• Spraying of Fenobucarb 50 % EC @ 10 ml/10 liter of water at 75 days after transplanting.</li> </ul>
43	<p>For solid waste management with 87 per cent reduction in volume per quintal and for obtaining good quality compost in 22-30 days with more monetary returns, it is recommended to release approximate, 10,000 larvae of Black soldier fly (<i>Hermetia illucens</i>) (5 kg larvae) per quintal of kitchen waste is recommended.</p>
44	<p>For effective management of major pest complex of chilli from nursery to the last pickings with getting higher cost benefit ratio and also to minimize the harmful effect by the continuous use of chemical insecticide following module is recommended.</p> <p><b>In nursery:</b></p> <ul style="list-style-type: none"> <li>• Seed treatment with Thiamethoxam 30% FS @ 7ml/kg of seed before sowing.</li> <li>• Spray with Neem oil (CNO) 2% at 30 DAS</li> <li>• Spray with Ethion 50% EC @ 2 ml/L at 45 DAS.</li> </ul> <p><b>In field before transplanting</b></p> <ul style="list-style-type: none"> <li>• Soil application of Neem cake 2.5qt/ha before transplanting</li> </ul> <p><b>In field at the time of transplanting</b></p> <ul style="list-style-type: none"> <li>• Seedling treatment with Imidacloprid 17.8% SL @ 0.5 ml/L for leaf portion followed by captan 75 % WP @ 1.7g/L root dipping for 10 min before transplanting.</li> <li>• Growing of Maize as a border row</li> </ul> <p><b>After transplanting</b></p> <ul style="list-style-type: none"> <li>• Installation Yellow Sticky trap (YST) along the crop canopy from 15 days after transplanting to maturity of the crop at a monthly interval.</li> <li>• Spray of NSE 5% at 15 DAT.</li> <li>• Spray of Fipronil 5% SC @ 2ml/L at 30 DAT.</li> <li>• Spray of NSE 7% at 45 DAT.</li> <li>• Spray of Acetamiprid 20% SP @ 0.2gm/L at 60 DAT.</li> <li>• Spray of Spiromesifen 22.9% SC @ 0.8ml/L at 75 DAT.</li> <li>• Spray of NSE 10% at 90 DAT.</li> <li>• Collection &amp; destruction of infested fruits and bigger size larvae of fruit borer, when the crop is at fruiting stage</li> <li>• Spray of Imidacloprid 17.8% SL @ 0.5 ml/L at 105 DAT.</li> <li>• Spray of Spinosad 45% SC @ 0.32 ml/L at 120 DAT</li> <li>• Spray of Emamectin benzoate 5% SG @ 0.4 g/L at 135 DAT.</li> <li>• Spray of Fenpropathrin 30% EC @ 0.35 ml/L at 150 DAT.</li> </ul>
45	<p>For trapping of maximum moth catches of pink bollworm, it is recommended to switch on the lamp of light trap for the period of 3.30 to 5.30 am. in morning or from 6.00 to 8.00 pm at evening.</p>
46	<p>For effective management of major insect pests of sunflower and getting maximum monetary returns,</p> <ul style="list-style-type: none"> <li>• Seed treatment with Imidacloprid 48% FS @ 5 ml/kg seed, spraying of cypermethrin 10 % EC @ 1.5ml/lit at starbud and flowering stage of crop.</li> </ul> <p style="text-align: center;"><b>or</b></p>



	Seed treatment with Thiamethoxam 30 % FS @ 3 ml/kg seed, spraying of cypermethrin 10 % EC @ 1.5ml/lit at starbud and NSE 5 % at flowering stage of crop is recommended.																																								
47	Safflower genotype viz. <b>AKS-351</b> is recommended as a donor for tolerant to aphids.																																								
<b>F</b>	<b>Agricultural Engineering &amp; Technology</b>																																								
48	PDKV developed horizontal well recharge filter with combination of coarse sand, gravel, charcoal and gravel (4:2:2:2) of dimensions 2.0m x 0.60m x 0.45m is recommended for well recharging.																																								
49	<p>It is recommended to use the crop coefficient values given in table for determining water requirement of summer sesame crop.</p> <table><tr><th>Week after sowing</th><th>Crop coefficient</th><th>Week after sowing</th><th>Crop coefficient</th></tr><tr><td>1</td><td>0.43</td><td>10</td><td>1.3</td></tr><tr><td>2</td><td>0.55</td><td>11</td><td>1.29</td></tr><tr><td>3</td><td>0.68</td><td>12</td><td>1.23</td></tr><tr><td>4</td><td>0.81</td><td>13</td><td>1.12</td></tr><tr><td>5</td><td>0.93</td><td>14</td><td>0.97</td></tr><tr><td>6</td><td>1.05</td><td>15</td><td>0.77</td></tr><tr><td>7</td><td>1.15</td><td>16</td><td>0.57</td></tr><tr><td>8</td><td>1.23</td><td>17</td><td>0.47</td></tr><tr><td>9</td><td>1.28</td><td></td><td></td></tr></table> <p>Alternative for above table following equation is recommended.</p> $Kc_t = -3.7933\left(\frac{t}{T}\right)^3 + 2.2841\left(\frac{t}{T}\right)^2 + 1.6237\left(\frac{t}{T}\right) + 0.3229$ <p><math>Kc_t</math>            -        Crop coefficient of <math>t^{\text{th}}</math> day. <math>t</math>                -        Day after sowing <math>T</math>               -        Total period of crop</p>	Week after sowing	Crop coefficient	Week after sowing	Crop coefficient	1	0.43	10	1.3	2	0.55	11	1.29	3	0.68	12	1.23	4	0.81	13	1.12	5	0.93	14	0.97	6	1.05	15	0.77	7	1.15	16	0.57	8	1.23	17	0.47	9	1.28		
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50	<p>It is recommended to use the crop coefficient values given in table for determining water requirement of summer green gram crop.</p> <table><tr><th>Week after sowing</th><th>Crop coefficient</th><th>Week after sowing</th><th>Crop coefficient</th></tr><tr><td>1</td><td>0.56</td><td>7</td><td>1.2</td></tr><tr><td>2</td><td>0.65</td><td>8</td><td>1.21</td></tr><tr><td>3</td><td>0.77</td><td>9</td><td>1.15</td></tr><tr><td>4</td><td>0.9</td><td>10</td><td>0.99</td></tr><tr><td>5</td><td>1.03</td><td>11</td><td>0.72</td></tr><tr><td>6</td><td>1.13</td><td></td><td></td></tr></table> <p>Alternative for above table following equation is recommended.</p> $Kc_t = -3.8882\left(\frac{t}{T}\right)^3 + 3.9756\left(\frac{t}{T}\right)^2 + 0.1172\left(\frac{t}{T}\right) + 0.5182$ <p><math>Kc_t</math>            -        Crop coefficient of <math>t^{\text{th}}</math> day. <math>t</math>                -        Day after sowing <math>T</math>               -        Total period of crop</p>	Week after sowing	Crop coefficient	Week after sowing	Crop coefficient	1	0.56	7	1.2	2	0.65	8	1.21	3	0.77	9	1.15	4	0.9	10	0.99	5	1.03	11	0.72	6	1.13														
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51	<p>For estimation of near real time spatial and temporal crop coefficient values and getting accurate water requirement of rabi wheat and onion, it is recommended to use Normalized Difference Water Index (NDWI) based following equations: For wheat: <math>Kc = 3.608 \times NDWI + 0.433</math> For onion: <math>Kc = 3.231 \times NDWI + 0.603</math></p>																																								
52	PDKV developed naturally ventilated double burner biomass cook stove is recommended to use for cooking.																																								

53	PDKV solar powered biomass-based air purifier is recommended to purify indoor air.
54	Tractor operated MPUAT Cotton Stalk Shredder with Dr. PDKV modified sweep is recommended for shredding and uprooting of cotton.
55	It is recommended to install 3 UV-C tubes of 254 nm wavelength and 30 watts capacity behind 5000 CFM Air Handling Unit (AHU) in 15.4 m x 18.29 m x 9.14 m size cold rooms and switch ON for 2 hours every day for reducing microbial load of air in cold rooms and rotting of stored Nagpur Mandring of Stored Nagpur Mandarin fruits.
56	PDKV developed tractor operated mobile dal mill is recommended for wheat cleaning and grading.
57	It is recommended to use PDKV developed Ventilated Onion Storage structure (capacity 10 tonnes) for storage of rabi onions up to 180 days.
58	It is recommended to use PDKV onion spoilage detection device for early detection of onion spoilage in onion storage structure having capacity of 2.5 tons.
<b>G</b>	<b>Social Science</b>
<b>i</b>	<b>Agricultural Extension Education</b>
59	Rural youth has positive towards different agri-enterprises. They mostly preferred dairy farming, poultry farming, fishery and vegetable farming agri-enterprises. Hence it is recommended that the extension functionaries, concern development agencies and policy makers should promote dairy farming, poultry farming, fishery and vegetable farming as an agri-enterprises for the rural youth of Eastern Vidarbha Zone by providing them production and marketing related technical knowledge and skill-oriented trainings and financial support.
60	Non availability of protective accessories like hand gloves, nose mask and goggle in local market was the major constraint reported by most of the farmers. Hence it is recommended that protective covers like hand gloves, nose mask and goggle shall be made available to the purchaser to minimize health hazards during insecticide spraying.
61	<i>Phytophthora</i> management practices under TOT RKVY project had positive technological impact on tree canopy improved by 27.74 per cent, gum oozing controlled by 29.82 per cent, fruit drop controlled 32.43 per cent, fruit quality improved by 28.34 per cent, yield increased by 22.77 per cent and overall impact on Mandarin growers was 29.31 per cent. It is therefore recommended that, improved <i>Phytophthora</i> management practices should be effectively implemented through the schemes of State Agriculture Department.
62	Majority of the Bt. Cotton growers were observed in medium level of knowledge (66.00%) and adoption (64.00%) about integrated nutrient management practices. Therefore, it is recommended that, extension agencies should organize training programmes, farmer field school and demonstration for the Bt. Cotton growers on integrated nutrient management practices.
63	Major technological gap in the summer groundnut cultivation by the farmers were found in seed treatment (67.50%), fertilizer application (56.66%) and plant protection measures (53.33%). It is therefore, recommended that, while organising the demonstrations and training programme on groundnut cultivation, the major emphasis should be given on recommended seed treatment, fertilizer application and plant protection measures by the extension agencies.
64	PDKV online <i>e-shetkari sanwad</i> advisory programme is highly effective expressed by the farmers 78 per cent and it helped to increase in the knowledge (74%), adoption (60%) and crop yield (20%) of farmers. Hence, it is recommended that time saving and cost effective PDKV online <i>e-shetkari sanwad</i> advisory model shall be adopted and popularise by the extension agencies to provide agricultural advisory to the farmers.
<b>ii</b>	<b>Agricultural Economics</b>
65	The benefit cost ratio in Soybean cultivation by using BBF Planter (1.62) developed by PDKV, than conventional method (1.16). The variable cost was reduced at 16147.00/- Rs./ha. by using BBF planter method over the conventional method. On the other hand, the additional returns was increased at 24043.00/- Rs/ha. Hence, it is recommended that, Soybean cultivation by using BBF Planter developed by PDKV need to be popularized through extension functionaries for higher

	returns with low cost.																
66	Amongst the five marketing channels of small size oranges, the highest market margin (Rs. 4826/- per qt) was estimated for channel of Producer → Wholesaler → Processing firm → Super stockiest → Dealer → Retailer → Consumer. Hence, it is recommended that, producer need to be sell their low grade orange through this channel for better remunerative prices.																
67	The Benefit Cost Ratio of Tricho-card beneficiary (1:1.43) cotton farmer was more profitable than non-beneficiary (1:1.16). Similarly production has been increased by 19.38 per cent with gross returns of 22136Rs./ha (20.26 per cent more) due to use of Tricho-card technology in cotton cultivation. Hence, it is recommended that Tricho-card technology need to be promoted and disseminated through the extension agencies, along with timely and sufficient availability of Tricho-card at taluka level.																
68	Summer paddy (1:1.86) and summer mung (1:1.56) were economically profitable in Eastern Vidarbha Zone. The cost of cultivation of paddy was found (108140/-Rs./ha) higher than mung (49123/-Rs./ha). Crop duration and total number of irrigations required for mung (60-65 days and 6 Nos.) was less than paddy (115-120 days and 29 Nos.). Hence it is recommended that the farmer those having limited availability of capital and irrigation may be cultivate mung during summer season in Eastern Vidarbha Zone.																
69	The Benefit Cost Ratio of Tricho-card beneficiary (1:1.29) paddy farmer was more profitable than non-beneficiary (1:1.13). Similarly production has been increased by 11.20 per cent with gross returns of 8930.07 Rs./ha (11.18 Per cent more) due to use of Tricho-card technology in paddy cultivation. Hence, it is recommended that Tricho-card technology need to be promoted and disseminated through the extension agencies, along with timely and sufficient availability of Tricho-card at taluka level.																
70	<div>It is recommended that, for Groundnut and Linseed of Small, Medium and Large processing unit should process minimum oil production (Break Even Point) as given below.</div> <table><tr><td>Size of unit</td><td>Linseed Oil (KG)</td><td>Groundnut Oil (KG)</td><td>Total Oil (KG)</td></tr><tr><td>Small</td><td>502.91</td><td>828.37</td><td>1331.28</td></tr><tr><td>Medium</td><td>1459.98</td><td>1228.19</td><td>2688.17</td></tr><tr><td>Large</td><td>1838.17</td><td>1575.06</td><td>3413.23</td></tr></table>	Size of unit	Linseed Oil (KG)	Groundnut Oil (KG)	Total Oil (KG)	Small	502.91	828.37	1331.28	Medium	1459.98	1228.19	2688.17	Large	1838.17	1575.06	3413.23
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71	Amaranths crop production was economically profitable to the farmers with B. C ratio 1: 2.75, therefore, it is recommended that, extension agencies should promote and disseminate the amaranths cultivation in the region for wider adoption.																
72	Paddy productivity has been increased by 19.84 per cent with reduction in the cost of Rs. 7375.89/- per hectare in high level of adoption of Integrated Pest Management Technology. Hence, it is recommended that, the IPM technology need to be promote and disseminate through the extension agencies for wider adoption in paddy																