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(Research Recommendations released during the year 2020-2021)

Research Accomplishments and Recommendations-2021

Two crop varieties viz. Rice PDKV Sadhana and Rabi Hurda Sorghum Trombay Akola Suruchi have been released (Jt. Agresco-2021). Two crop varieties Soybean PDKV Amba and Sorghum CSV-45 are released at national level. Five farm implements and machineries have been released. Total 34 recommendations of various production technologies have been released.

1. Released Crop Varieties:

Sl. No.	Crop	Variety	Salient features	
1	Rice	PDKV Sadhana (SKL-3-1-41-8-33-15)	• It is early duration rice variety 119 days (118-120 days) • Dwarf stature 99 cm(91-106 cm) • Long slender grains with 1000 grain weight 25.7 g. • Average grain yield 5000 kg/ha in Vidarbha region . • Milling 71.70 %, Good head rice recovery (55.74%) with intermediate AC (24.28 %) , good cooking and eating quality. • PDKV Sadhana (SKL-3-1-41-8-33-15) is recommended in Vidarbha region under transplanted condition for kharif season	 
Recommendation: An early duration, high yielding and long slender grain rice variety PDKV Sadhana (SKL-3-1-41-8-33-15) is recommended for cultivation in Vidarbha under transplanted condition for Kharif season.				
2	Rabi Hurda Sorghum	TAKPS-5 (Trombay Akola Suruchi)	• Hurda of TAKPS 5 is of high quality & sweet in taste. • Green hurda yield: 40-41q/ha. • Green fodder yield: 115 q/ha. • Duration: 90 – 95 days. • Resistant to stem borer & stem fly. • TAKPS 5 is recommended for rabi season	
Recommendation: Rabi Sorghum Variety TAKPS-5 (Trombay Akola Suruchi) with higher hurda yield, sweet taste, good aroma and easy threshability is recommended for release in the rainfed Rabi Sorghum area of Vidarbha region.				

Crop Varieties Released at National Level

1	Sorghum	CSV 45	• Higher grain yield (33.45 q/ha) and higher fodder yield (129.98 q/ha) • Maturity 110 days • Plant height 235 cm • **Quality traits-** Nutritional constituents responsible for roti quality • **Grain characteristics-** Pearly white, lustrous, bold grains • **Resistant to diseases -** Good reaction towards grain mold tolerance also promising performance for Zonate leaf spot and leaf blight. • **Resistant to insect pests-** Promising performance for the shootfly dead hearts % at 28 days, stem borer leaf injury rating at 35 days , stem borer dead hearts % at 45 days, aphid damage rating. • **Recommended for Area-** Maharashtra, Madhya Pradesh and Tamil Nadu states.	
2.	Soybean	AMS 100-39 (PDKV Amba)	• Maturity duration (days): 94-96 days • Average yield: 28-30 q/ha. • Oil (20.5%) & protein content (44%) comparatively more than other varieties. • It has shown moderately resistance to girdle beetle and stem fly and charcoal rot disease. • Pod shattering resistance up to 10-12 days from harvest maturity. • Recommended for Area : Central Zone (Maharashtra, MP, Rajasthan, Gujarat Bundelkhand region of UP)	

2. Released Farm Implements/Machinery:

Sl. No.	Implement/ Machinery	Particulars	Salient features	
1	Tractor Operated Offset Road Side Grass Cutter	It is recommended to use PDKV developed tractor operated offset road side grass cutter for removing weeds, grasses and unwanted planted along road side and field boundaries.	• The implement can be used to cut road side grass, weeds and unwanted plants. • The cutting efficiency of this implement was found to be 90.21 to 93.13 %. • Fuel efficiency was found to be 4.22 to 4.30 l/h. • The average width of cut of tractor operated offset road side grass cutter was found 72 cm. • The range of forward speed of tractor operated offset road side grass cutter was found 2.10-2.25 ha/h. • The range of field efficiency of tractor operated offset road side grass cutter was found 75.28 to 83.90 %. • Capable to cut 10-15 cm diameter unwanted plants	
2	Bullock Drawn Puddler	PDKV bullock drawn puddler is recommended for puddling operation of paddy (rice) field in sandy loam soil of Eastern Vidharbha	• PDKV developed bullock drawn puddler used for puddling of Paddy field. • Green manure or weeds are completely buried in the mud. • This machine is operated with the help of a pair of bullocks and the machine does not get stuck in the mud during the puddling. • The field capacity was found 0.176 ha/hr and efficiency is 70.45 %. • Puddling Index is 39.50%.	
3	Sorghum *hurda* extraction machine for tender sorghum	PDKV Sorghum hurda extraction machine is recommended to release for sorghum hurda extraction.	• Useful for extraction of hurda from green sorghum kernels. • The hurda extraction capacity is 180 kg/h. • The machine is operated on 1 horse power motor. • The hurda extraction efficiency is 93 %. • Damage of hurda is minimal during extraction. • The belt clearance can be adjusted as per the size of sorghum kernel. • Operational cost of machine is less and easy for handling	

4	Chironji nut (*Buchanania lanzan*) Grader cum Decorticator	PDKV Chironji nut Grader cum Decorticator is recommended to release for chironji nut grading and chironji nut decortication process.	• Two important operations grading and decortication can be simultaneously performed by using this machine. • The mechanism consist of Grader unit with grading efficiency of 98.81%. • The mechanism consist of Decorticator unit with decorticating efficiency of 92.89%. • The weight of the machine is 75 kgs and is portable. • The developed Chironji nut Grader cum Decorticator assures the safety of the operator. • The mechanism was portable, thus, would be easily shifted / transported from one place to another. • Even an unskilled labour was able to easily operate the developed decorticator. • The easy mechanism helps to reduce the processing cost and maintenance cost. • The developed Chironji nut Decorticator would help the cooperative farmers, tribal people, small, medium and large scale farmers, self help groups (SHG), bachat gats, unemployed youths to become an entrepreneur.	
5	Wet red chilli seed extractor	PDKV wet red chilli seed extractor (capacity - 300 kg/h) is recommended for extraction seed from wet red chillies.	• Capacity of the machine is 300 kg/h • The seed extraction efficiency is 95-97 %. • Power requirement of machine is 3 phase, 3 hp electric motor. • Seed extraction machine is useful for seed growers. • No effect on seed germination. • The machine is easy to operate. • An unskilled person can operate this machine.	

3. Natural Resource Management

a. Agronomy:

1	In medium deep black zinc and sulphur deficient soils of Vidarbha region, for obtaining higher safflower yield, monetary returns and maintaining soil fertility, application of FYM 5 t ha^{-1} or *in situ* green gram residue incorporation into soil and nitrogen, phosphorus, potassium as per yield target equation +25 kg ha^{-1} zinc sulphate and 10 kg ha^{-1}sulphur is recommended. **Targeted yield equation for safflower (JNKVV, Jabalpur)** Nitrogen through fertilizer kg/ha = 9.11 X (Targeted yield q/ha) – 0.45 X (Available soil nitrogen kg/ha) Phosphorus through fertilizer kg/ha = 6.27 X (Targeted yield q/ha) – 2.19 X (Available soil phosphorus kg/ha) Potassium through fertilizer kg/ha = 9.27 X (Targeted yield q/ha) – 0.38 X (Available soil Potassium kg/ha)
2	For obtaining higher productivity and economic returns in soybean-onion crop sequence, it is recommended to apply 75 % RDF (25:60:25 kg NPK ha^{-1}) + FYM 5 t ha^{-1} + Biofertilizers (*Rhizobium japonicum*+ PSB + *Tricoderma viridi*) to soybean and 100% RDF (100:50:50 kg NPK ha^{-1}) to rabi season onion crop is recommended.
3	Sowing of rice variety Avishkar is recommended under upland irrigated condition of western Vidarbha with the fertilizer dose of 100:50:50 kg NPK ha^{-1} (RDF) along with $FeSO_4$ @ 25 kg ha^{-1} and $MnSO_4$ @ 5 kg ha^{-1} at the time of sowing for obtaining iron and manganese enriched higher rice grain yield, grain protein, carbohydrate content and economic returns.
4	For obtaining higher sunflower equivalent yield and monetary returns in cropping system, it is recommended to undertake the sowing of Mung with 100% RDF (20:40:20 kg NPK ha^{-1}) or Soybean with 100% RDF (30:75:30 kg NPK ha^{-1}) in *Kharif* season and sunflower with 100% STCR based fertilizer dose in *Rabi* season. **STCR equation for Sunflower(Source: MPKV, Rahuri)** Nitrogen through fertilizer (Kg/ha) = 13.94 x Target yield (q/ha) – (0.61x available nitrogen in soil in Kg/ha.) Phosphorus through fertilizer (Kg/ha) = 7.18 x Target yield (q/ha) – (0.82 x available phosphorus in soil) Potassium through fertilizer (Kg/ha) = 3.53 x Target yield (q/ha) – (0.05 x available potassium in soil)
5	In organic farming system, soil application of 2.5 t/ha enriched PDKV compost mixed with *Rhizobium* and PSB @ 4.0 kg/ha along with two foliar sprays of liquid organic fertilizer (N:P:K) @ 30 ml / 10 lit. water at 20 and 40 DAS and for biological pest control spraying of botanical insecticide (Dashparni Ark or 5 % NSKE) and bio-pesticides (Beauveria and Metarhizium) is recommended for higher yield, monetary returns of green gram and sustainable soil fertility.
6	In organic farming system, soil application of 8 t/ha enriched PDKV compost mixed with *Rhizobium* and PSB @ 4.0 kg/ha along with three foliar sprays of liquid organic fertilizer (N:P:K) @ 30 ml / 10lit water at 20, 40 and 60 DAS and for biological pest control spraying of botanical insecticide (Dashparni Ark or 5 % NSKE) and bio-pesticide (Beauveria and Metarhizium) is recommended for higher yield, monetary returns of wheat and sustainable soil fertility.
7	In medium deep black souls under rainfed conditions of Vidarbha, for achieving higher seed yield, monetary returns and rainwater use efficiency from the medium duration sole pigeonpea crop, sowing at a distance of 120 cm x 30 cm and nipping at 45 days after sowing is recommended.
8	In zinc and boron deficit soils for obtaining higher seed yield and economic returns of linseed crop along with recommended dose of fertilizer (60:30:00 Kg ha-1 NPK) foliar application of ZnSO4 @ 0.5 % (5 g/liter of water) + Borax @ 0.3% (3 g/liter of water) at 45 DAS is recommended.

b. Soil Science and Agricultural Chemistry:

9	In sulphur deficient soils for obtaining higher seed yield of chickpea, quality of seed, higher monetary returns and for improving soil fertility, soil application of S @ 30 kg ha-1 through Bentonite sulphur (35 kg ha-1) or through Gypsum (130 kg ha-1) along with recommended dose of fertilizer (25:50:30 kg ha-1 N, P2O5 & K2O) is recommended.

10	In view of the higher use efficiency, release and fixation pattern of Phosphorus, it is recommended to use 30:60:30 kg N, P2O5 and K2O ha-1 for getting higher soybean yield and monetary returns in Vertisols of Vidarbha.
11	Alkaline (0.5 N) extraction method is recommended for higher recovery, nutrient composition and functional group of humic substances extracted from vermicompost.
12	"PDKV Enriched Compost" method for rapid preparation of wheat straw compost with addition of glyricidia leaves, rock phosphate, elemental sulphur along with PDKV Decomposer is recommended.

4. Horticulture:

a.	**Vagetable Crops**
13	Under Vidarbha conditions, for getting maximum yield and higher monetary returns from Sweet corn cultivation, application of 5 ton Farm Yard Manure (FYM) along with 200 kg nitrogen, 80 kg phosphorus and 80 kg potassium per hectare is recommended.
14	For Preparation of nutritive and delicious cookies of aerial yam, per 1000 g of composite flour, addition of 60 % aerial yam flour in wheat flour+ 600 g. sugar+ 500g Vanaspati ghee + 10 g. sodium bicarbonate is recommended.
b.	**Medicinal & Aromatic Plants**
15	Green gram - Ashwagandha Crop sequence is recommended for getting higher dry root yield and economic returns with quality roots of Ashwagandha.
16	Intercropping of Safed musli + Pigeon pea with 3:1 or Safed musli + Maize 3:1 row proportion is recommended for higher dry root yield and economic returns, maximum saponin content and minimum Percent incidence of root rot.
17	Kawachbeej – Cluster bean sequence cropping is recommended for getting higher economic yield and L-DOPA content in Kawachbeej.

5. Plant Protection:

18	For effective management of hoppers on paddy, getting higher yield and monetary returns, leave alleyways of 30 cm after every 10 rows (or 2 m) during line transplanting (20 X 15 cm) with rope. Further, at incidence of hoppers noticed spraying of Flonicamid 50 % WG @ 3 g followed by Fipronil 5% SC @ 20 ml per 10 liter water 15 days after first spraying is recommended.
19	For effective management of brown plant hoppers and getting higher grain yield with higher economic return, spraying of Flonicamid 50% WG @ 3 g/10 Liter water after attaining ETL (10 hoppers at tillering stage and 5-10 hoppers at panicle stage) of pest, followed by second spraying of Pymetrozine 50 % WG @ 6 g/10 Liter water at 15 days interval is recommended.
20	For effective management of pink bollworm on cotton with higher economic returns, six releases of Trichogrammatoidea bactrae @ 1 lakh eggs/hectare at an interval of 10 days, starting from 55 days of crop germination is recommended.
21	For effective management of sorghum midge fly, increasing the grain yield and incremental cost benefit, at 50 % earhead emergence neem seed extract @ 5% and after 10 days dimethoate 30 % EC @ 16 ml/10 lit water spray is recommended.
22	*Steinernema bicornatum, Heterorhabditis indica and Steinernema siamkayi* were identified as the three parasitic nematodes isolated from guava garden soil. Considering the pathogenecity potential (mortality rate 51-85%) of these three parasitic nematodes against lepidopterous insects like *Helicoverpa armigera, Semilooper, Corcyra cephlonica and Galleria mellonella insects.It is recommended to use them for registration in the group of useful microorganisms as wel as for further study on pest control*.
23	For the management of gummosis of Nagpur mandarin, Bordeaux paste (1: 1: 10) should be pasted twice, before the rainy season (May) and after the rainy season (October) regularly on the trunk of the plant. At the initiation of gummosis disease *Trichoderma harzianum* plus *Pseudomonas fluorescens* plus *Mycorrhiza* 100 g each should be mixed with 1 kg of FYM and apply at the periphery of each plant. It is also recommended to apply ferrous sulphate plus zinc sulphate @ 200 g each at the periphery of the plant at interval of 8 days.

6. Agricultural Engineering & Technology:

24	1. It is recommended to prepare Nagpur mandarin juice powder with soy protein isolate (2.10%), GMS (2.75%), CMC (1.75%), sugar content (5.50%) and whipping time (8 min). 2. It is recommended to prepare Nagpur mandarin juice powder with soy protein isolate 3.30%, guar gum 0.45%, sugar content 10% and whipping time 6 min. 3. It is recommended that for making Nagpur Mandarin juice powder from foam mat microwave drying at 540W microwave power and 3 mm drying bed thickness.
25	It is recommended to use Ashwagandha, Shatavari, Gudwel, Kandwel and Bramhi powder in wheat flour for cookies preparation.
26	Paddy growing farmers of Vidarbha region are advised to cultivate paddy on the 40 micron plastic mulching.
27	It is recommended to install decentralized on grid Solar PV Power Plant for Electricity Generation in Institutional Buildings in view to Initiate Green Energy Utilization, Energy Conservation, Revenue Generation and Environmental Protection.

7. Animal Husbundary & Dairy Science:

28	Feeding of 3 kg concentrate (>18 % CP) per day from 08 weeks before probable day of calving is recommended to the crossbred Jersey cows having average 300 (± 50) kg body weights for better health of calf and increase in milk production.
29	Under intensive poultry rearing system, supplementation of 3% linseed oil is recommended in the feed of Giriraja birds to enriched omega-3 in the meat with higher body weight gain.
30	Preparation of value added Kalakand is recommended for blending 15% ripe wood apple pulp (2.5 % of milk) in cow milk chhana with 5 days under room temperature & 20 days on refrigerated temperature to maintain keeping quality.

8. Social Science:

a. Agricultural Economics:

31	The farmers earned gross economic benefit of Rs. 841.68 Crores during last six year from PKV Tara variety of pigeon pea released by Dr. PDKV, Akola. It is therefore recommended that government should strengthen the University for further research and extension of improved varieties for the benefit of farmers.
32	The farmers earned gross economic benefit of was Rs.1383.20 crores during last fifteen years from Kopergaon variety of green gram and Rs.3904.72 Crores during last fifteen years from TAU 1 variety of black gram released by Dr. PDKV, Akola. Considering the farmers demand for seed of Kopergaon & TAU 1 variety, it is need to increase the seed production. It is therefore recommended that government should strengthen the University for further research and extension of improved varieties for the benefit of farming community.
33	The farmers earned gross economic benefit of Rs. 2174.22 Crores during the last fifteen years from TAG 24 variety of groundnut released by Dr. PDKV, Akola. Considering the farmers demand for TAG-24 seed, there is need to increase the seed production. It is therefore recommended that government should enable to the University for further Research and Extension of improved varieties for the benefit of farming community.

b. Extension Education:

34	**(Combined Recommendation of Dept. of Extn. Educ. & Agril. Econ. & Stat.)** Drill method of paddy cultivation is found economically more beneficial among conventional transplanting, SRI and broadcasting methods. The major constraints found in adoption of drill method of paddy cultivation were non availability of drill paddy machine at proper time of sowing (82 %), no subsidy on drill paddy machine (74%) and high cost of drill paddy machine (71%). It is therefore recommended that drill paddy machine should be made available to the farmers at subsidized rate under agriculture mechanization scheme of State Department of Agriculture for increasing the area under drill paddy cultivation.