Research Recommendations Released during 2025 by Mahatma Phule Krishi Vidyapeeth, Rahuri

Natural Resource Management

Agronomy

1. Bending of paddy seedlings by dragging a wooden plank (weighing 6-8 kg, 6-8 feet long, and 15 cm wide) after 15-20 days of transplanting and again after 25-30 days after transplanting in reverse directionat 8-10 cm water level is recommended to obtain higher yield (20%) and monetary returns in paddy.
2. Sowing of irrigated Bt cotton under high density planting system at 60 cm x 30 cm or 90 cm x 30 cm spacing along with canopy management i.e. removal of monopodia at 40 DAS and detopping at 70 DAS higher seed cotton yield and net monetary returns in Western Maharashtra.
3. In organic farming, nipping of pigeonpea at 50 days after sowing and biofertigation of jeevamrut @ 400 litre ha-1 in four equal splits at 30, 45, 60 and 90 days after sowing is recommended for higher yield, monetary returns and improvement of soil health.
4. In organic farming, the application of 50% N through neem powder (1100 kg ha^{-1}) + 50% N through poultry manure (1650 kg ha^{-1}) is recommended to *kharif* season okra for higher yield, monetary returns and improvement of soil health.
5. In organic farming, incorporation of dhaincha at 50% flowering stage as green manuring crop during kharif season followed by application of Jeevamrut @ 500 lit ha-1 each through second and third irrigation to rabi onion crop is recommended for higher yield, monetary returns and improvement of soil health.
6. In organic farming, the application of vermicompost 10 kg $tree^{-1}$ at the time of flowering and twice tank mix organic formulation of Jeevamrut + EM solution @ 10 litre $tree^{-1}$ at flowering and one month after flowering is recommended to mango crop for higher yield, monetary returns and improvement of soil health.
7. In organic farming, the application of Farm Yard Manure + Neem Powder + Vermicompost + Poultry Manure @ 2.5 kg each $tree^{-1}$ at the time of bahar treatment and in-situ green manuring of dhaincha at flowering stage @ 10 kg $tree^{-1}$ to guava crop is recommended for higher yield, monetary returns and improvement of soil health.
8. Sowing of *rabi* Okra in 42 MW (15-21 Oct) and application of following fertilizer dose along with 20 t/ha FYM is recommended for irrigated situation in plain zone of Western Maharashtra for higher fruit yield and monetary returns.

Time of fertilizer application	**Fertilizer dose (kg/ha)**		
	N	**P_2O_5**	**K_2O**
At sowing	50	50	75
30 DAS	16	-	25
45 DAS	17	-	-
60 DAS	17	-	-
Total	**100**	**50**	**100**

9. In *kharif* season, under delayed monsoon condition for contingent cropping, sowing of pigeonpea, sunflower, soybean, pearlmillet, horse gram and moth bean is recommended upto 15th July with reduction in yield below 12 percent on shallow soils of scarcity zone of Western Maharashtra.

10. Harvesting of mature culms every year is recommended after four years by maintaining latest two or three years culms in the bamboo clumps for higher bamboo production with more girth and height.

Soil Science

11. Application of vermicompost @ 3 t ha^{-1} along with recommended dose of fertilizer (120:60:40 N:P_2O_5:K_2O kg ha^{-1}) to wheat crop is recommended for improvement of soil health and higher yield in medium deep black soils of Western Maharashtra.
12. Soil application of 75% recommended dose of Nitrogen (90 kg ha^{-1}), recommended dose of Phosphorus (60 kg ha^{-1}) and potassium (40 kg ha^{-1}) + 10 t ha^{-1} FYM followed by two foliar applications of 2% urea (20g L^{-1}) at 30 and 60 days after sowing is recommended for higher grain yield and economic returns of maize for Sub-montane Zone of Maharashtra.
13. Soil application of recommended dose of fertilizer (50 kg N: 75 kg P_2O_5 : 45 kg K_2O + 10 t FYM ha^{-1}) along with foliar application of 2000 ppm (2 g L^{-1}) chelated zinc 35 days after sowing is recommended for higher grain yield and economic returns of soybean for sub-Montane Zone of Maharashtra.
14. Application of the 75 % recommended dose of N through Gliricidia (10 t ha^{-1}) + 25% N through paddy straw compost (2.5 t ha^{-1}) to lowland paddy at the time of puddling is recommended for higher in monetary returns and improvement of soil health under organic paddy cultivation in Western Ghat Zone of Maharashtra.
15. Soil application of 10 kg *Azospirillum* + 5 kg PSB (mixed in 100 kg FYM) at the time of planting + 25 t FYM ha^{-1} before planting and fertilizer nutrients as per STCR prescription equations for achieving 300 q ha^{-1} rhizome yield of turmeric is recommended for higher monetary returns and improvement of soil fertility in deep black soils of Western Maharashtra.

    Yield Target Equations for Turmeric

FN	=	0.92 x T	-	0.12 x SN	-	1.61 x FYM
FP_2O_5	=	0.50 x T	-	1.75 x SP	-	0.52 x FYM
FK_2O	=	0.77 x T	-	0.12 x SK	-	2.17 x FYM

    Where, T is turmeric yield in q ha^{-1}, FN, FP_2O_5 & FK_2O are fertilizer dose in kg ha^{-1}, SN, SP & SK are soil available N, P & K in kg ha^{-1} & FYM is quantity of FYM in t ha^{-1}
16. Application of revised fertilizer dose as 380:190:190 N:P_2O_5:K_2O kg ha^{-1} + 25 t ha^{-1} FYM is recommended to preseasonal sugarcane for higher monetary returns, cane and CCS yield of sugarcane cultivated in medium deep soils.

Interfaculty Department of Irrigation Water Management

17. Application of 80% recommended dose (80:40:40, N: P_2O_5: K_2O kg ha^{-1}) of water soluble fertilizers through drip fertigation in 15 splits at weekly interval as per following schedule is recommended for obtaining higher yield, efficient use of water and nutrient for summer ridge gourd in medium deep black soils of western Maharashtra.

Nutrients applied in 15 splits at weekly interval to summer ridge gourd

Days after transplanting	Weeks	Nitrogen		Phosphorus		Potassium	
		%	Kg ha^{-1}	%	Kg ha^{-1}	%	Kg ha^{-1}
1-28	4	25	20	30	12	20	08
29-56	4	30	24	40	16	30	12
57-84	4	30	24	20	08	30	12
85-105	3	15	12	10	04	20	08
Total	**15**	**100**	**80**	**100**	**40**	**100**	**40**

Animal Husbandary and Dairy Science

18. Use of 27 % betel vine leaves extract (10 g leaves + 100 ml water) of Calcutta variety, 1% fennel seeds extract (10 g fennel seed powder + 100 ml water) and 10% sugar to the weight of paneer whey is recommended to prepare paneer whey based popsicle.
19. In feeding management of crossbred heifers for higher growth, replacement of green fodder by forage cactus up to 10 per cent, however in shortage of green fodder up to 30 per cent is recommended.
20. Feeding of milk up to 4^{th} week and calf starter (26% DCP; 70% TDN) from 5^{th} week to 12^{th} week is recommended for better growth rate of crossbred calves.
21. Among the vermicomposting of cow dung, goat fecal, sheep beats, poultry manure and their combinations, sheep beats for economical and higher production and poultry manure for higher nutrient is recommended.
22. It is recommended that instead of selling indigenous cow milk, farmers get more profit by selling of processed ghee and skim milk lassi.
23. It is recommended that Quarg Cheese can be prepared by using 50% cow milk and 50 % goat milk.
24. It is recommended that for *preparation* of *Kulfi* Paneer whey can be fortified up to 20% in condensed milk (2:1) along with 16 % Sugar and 0.15% Stabilizer.

Plant Physiology/Biotechnology/Biochemistry/ Food Science and Technology

Biochemistry

25. Screening of sugarcane at tillering stage for biochemical parameters *viz*., chlorophyll stability index (above 34.0 %), lipid peroxidation (below 43.0 ηmole MDA g^{-1} FW), ascorbate peroxidase (above 565 ηmol. ascorbic acid oxidized min^{-1} mg^{-1} protein) and alcohol dehydrogenase (above 210 µmole NADH formed min^{-1} mg^{-1} protein) activities are recommended to identify partial submergence tolerant genotypes under flood.
26. Based on biochemical parameters analysed at laboratory and field conditions RSV 2481, RSV 2482 and RSLG 1876 sorghum genotypes are recommended as salinity tolerant donor in sorghum improvement programme.

Biotechnology

27. A modified casein agar plate assay technique is recommended for rapid and cost-effective screening to identify Kunitz Trypsin Inhibitor-free soybean lines.

Food Science and Technology

28. It is recommended to prepare good-quality multigrain biscuits using 400g wheat, 150g sorghum, 150g pearl millet, 275g finger millet, 25g oat flour each, 500g sugar, 500g vanaspati ghee, 5g ammonium bicarbonate, 5g sodium bicarbonate and wrapped in 100µ HDPE packaging material for storage at room temperature (32±2ºC) up to 40 days.

Plant protection

Entomology

29. Soil application of *Pseudomonas fluorescens* 0.5% WP ($2x10^6$ CFU/g) @ 2.5 kg alongwith 2.5 tons of FYM/ha 15 days before transplanting is recommended for effective management of root knot nematode in brinjal.
30. Seed treatment with sweet flag (*Acorus calamus*) powder @ 5g/kg pigeonpea and chickpea seed is recommended for protection from pulse beetle up to six months of storage.
31. Drenching of entomopathogenic nematode*, Heterorhabditis indica* (1000 IJs/ml) @ 2.5 L/ha in 500 L water near root zone at sufficient moisture after incidence of white grub noticed (June- July) is recommended for the control of white grub in sugarcane.

Plant Pathology and Microbiology

32. Two sprays of combi-fungicide propiconazole 10.7 % + tricyclazole 34.2% SE 0.1% @ 1 ml/lit of water at an interval of 15 days immediately after appearance of disease are recommended for effective management of leaf blast disease of paddy and maximum monetary returns.
33. Two sprays of tebuconazole 25.9 % EC @ 625 ml/ha with drone immediately after appearance of the disease at an interval of 10 days are recommended for effective management of pod blight of soybean, higher yield and monetary returns with following instructions.

    Instructions for drone use: Height above canopy: 2m, Drone speed: 5m/s, Average droplet size: 217.92 micron, Water volume: 25 lit./ha.
34. Two sprays of combi-fungicide azoxystrobin 18.2% + difenoconazole 11.4% SC @ 1 ml/lit of water immediately after appearance of the disease at an interval of 15 days are recommended for effective management of leaf spot disease of turmeric, maximum yield and monetary returns.
35. Seed treatment of MPKV bacterial consortium of *Azotobacter*, PSB and KMB @ 25 g/kg along with 75 % recommended dose of fertilizers [90:45:30 kg N (in three equal splits), P_2O_5 and K_2O/ha] is recommended in maize for higher grain yield, saving 25% dose of chemical fertilizers and maintaining soil fertility.
36. Soil application of liquid consortium of iron and zinc solubilizing microbial bioinoculant developed by VSI @ 5.0 lit ha^{-1} in 500 Kg FYM with 50% $FeSO_4$ @ 12.5kg ha^{-1} & $ZnSO_4$ @ 10kg ha^{-1} at the time of planting in iron and zinc deficient soil with recommended dose of fertilizer (300:140:140 kg ha^{-1} N, P_2O_5& K_2O) is recommended for higher cane and sugar yield in Suru sugarcane.

Agril. Engineering

Farm Machinery & Power/ Farm Structure & Rural Electrification

37. Mahatma Phule Krishi Vidyapeeth developed innovative farm implements package for **soil and water conservation in agriculture mechanization** is recommended to save inputs, time, cost of operation, reduce drudgery and increasing yield for.

    The package of innovative implements developed by MPKV for soil and water conservation in agriculture mechanization includes,

    - Tractor operated Phule automatic reversible MB plough
    - Tractor operated Phule Mole Plough
    - Tractor Operated Phule Check Basin Former
    - Tractor Operated Phule Basin Lister
    - Tractor Operated Phule Multicrop Ridger-Planter
    - Small Hp (Less Than 25 Hp) Tractor Operated Phule Multicrop Planter
    - Tractor Operated Phule Two Row Forward-Reverse Rotavator for Sugarcane Crop
    - Tractor operated Phule two side discharge shredder for orchards
    - Tractor operated Phule Sugercane leaf detrasher cum Shreader

Agril. Process Engineering

38. Wheat, pearl millet, sorghum, finger millet and soybean flour in the ratio of 45:20:15:15:05 is recommended for preparation of nutritious multi- grain cookies.
39. The following process is recommended for preparation of good quality cookies using encapsulated garden cress seed oil powder.
    1) Prepare a solution by dissolving 100 g whey protein powder in 200 mL distilled water, keep it overnight, then add 35 mL garden cress seed oil and distilled water to adjust 21 °Brix, and dry the mixture using spray drying at 155°C inlet temperature and 87 mL/h feed rate to obtain high-quality garden cress seed oil encapsulated powder.
    2) Cookies are prepared using 65 % wheat flour, 25 % finger millet flour, 10 % encapsulated garden cress seed oil powder with 0.5% sodium bicarbonate and ammonium bicarbonate each.
40. “Phule improved onion storage structure” is recommended to minimize losses during storage.

Irrigation & Drainage Engineering

41. Subsurface drainage system by perforated corrugated PVC pipes with geo-textile filter (drain spacing: 40m and drain depth: 1m) is recommended for effective drainage and economically feasible production from soybean-wheat cropping sequence in deep black clayey waterlogged soils.

Digital Agriculture

42. IoT enabled “Phule Pan Evaporimeter” developed by Mahatma Phule Krishi Vidyapeeth is recommended for recording real time pan evaporation.
43. IoT enabled “Phule Double Ring Infiltrometer” developed by Mahatma Phule Krishi Vidyapeeth is recommended for recording soil infiltration rate.

44. "PHULE PRASHANT Environmental friendly housing System" developed by Mahatma Phule Krishi Vidyapeeth is recommended to avoid the adverse effects of seasonal environmental changes on the animals.
45. The mobile application "Phule Smart Pest and Disease Management Advisory" developed by Mahatma Phule Agricultural University is recommended for effective management of pests and diseases of various crops.
46. It is recommended to use the following mobile app and web-based dashboard developed by Mahatma Phule Agricultural University.

Sr. No.	Mobile Application	Use
1.	Phule Dairy Pilot	Easy and effective daily management of cowsheds
2.	Phule Dairy Guide	Increasing efficiency, productivity and sustainability of dairy business
3.	Phule eDairy Farm	Effective livestock management
4.	Phule Dairyman System	Effective recording of milk production and its components

47. The crop coefficients given in the following table are recommended for the estimation of water requirement of Summer Fodder Bajra.

Crop Week	Kc	Crop Week	Kc
1	0.28	9	1.08
2	0.28	10	1.13
3	0.33	11	1.11
4	0.43	12	1.01
5	0.57	13	0.81
6	0.71	14	0.50
7	0.86	15	0.27
8	0.99		

Alternatively, the following equation is recommended.

$Kc_t = -7.5642(t/T)^3 + 8.8092(t/T)^2 - 1.2992(t/T) + 0.3208$

Where,

Kc_t = Crop Coefficient on t^{th} day,

t = Number of days since sowing,

T = Total Crop Period

48. The crop coefficients given in the following table are recommended for the estimation of water requirement of Summer Fodder Bajra with two harvesting practices

Crop Week	Kc	Crop Week after first cut	Kc
1	0.41	1	0.46
2	0.67	2	0.54
3	0.95	3	0.73
4	1.19	4	1.05
5	1.35	5	1.32
6	1.38	6	1.18
7	1.26		

Alternatively, following equations is recommended.

$Kc_t = -16.404\ (t/T)^3 + 6.9613\ (t/T)^2 + 2.6305\ (t/T) + 0.2739$ (for First cut)

$Kc_t = -207.37\ (t/T)^4 + 579.84(t/T)^3 - 594.59\ (t/T)^2 + 267.21\ (t/T) - 44.167$ (for Second cut)

where,

Kc_t = Crop Coefficient on t^{th} day,

t = Number of days since sowing,

T = Total Crop Period

49. The crop coefficients given in the following table are recommended for the estimation of water requirement of Summer Sesame.

Crop Week	Kc	Crop Week	Kc
1	0.49	8	1.04
2	0.56	9	0.97
3	0.71	10	0.87
4	0.88	11	0.76
5	1.00	12	0.65
6	1.07	13	0.51
7	1.08		

Alternatively, following equation is recommended.

$Kc_t = -17.461(t/T)^5 + 51.704(t/T)^4 - 55.107(t/T)^3 + 22.504(t/T)^2 - 1.708(t/T) + 0.5175$

Where,

Kc_t = Crop Coefficient on t^{th} day,

t = Number of days since sowing,

T = Total Crop Period

50. The crop coefficients given in the following table are recommended for the estimation of water requirement of Kharif Sesame.

Crop Week	Kc	Crop Week	Kc
1	0.34	8	1.11
2	0.65	9	1.14
3	0.76	10	1.08
4	0.81	11	0.91
5	0.86	12	0.66
6	0.93	13	0.37
7	1.03	14	0.18

Alternatively, following equation is recommended.

$Kc_t = 49.789\ (t/T)^5 - 132.1\ (t/T)^4 + 122.79\ (t/T)^3 - 50.221\ (t/T)^2 + 9.8656\ (t/T) + 0.023$

Where,

Kc_t = Crop Coefficient on t^{th} day,

t = Number of days since sowing,

T = Total Crop Period

51. Drone spraying protocol is recommended for the effective management of Leaf Spot disease and Leaf eating caterpillar (Spodoptera) pest and higher yield in soybean as following

1) Operate Hexa-copter spraying drone (10 lit capacity) at 2 m height above crop canopy with 3.5 m/s forward speed and 4 m swath in autonomous mode (Volume Mean Diameter (VMD) 171-231µm and droplet density 120-230 per cm^2).

2) Two sprays of tebuconazole 25.9% EC @ 250 ml/ 10 L of water per acre at an interval of 10 days after the appearance of incidence of leaf spot disease.
3) One spray of chlorantraniliprole 18.5% SC @ 60 ml/ 10 L per acre after the appearance of incidence of leaf eating caterpillar pest.

Social Science

Agril. Extension Education

52. It has been observed that most of the dairy farmers lack knowledge about the use of quality semen and importance of record keeping for improving milk yield, milk fat and disease resistance; and also, the supply of quality sex-sorted semen is not being done on time. Hence, it is recommended that Department of Animal Husbandry should provide training on these subjects as well as timely provision of quality, sex-sorted semen.
53. It is recommended that the Department of Agriculture, SAUs and KVKs should organised various extension activities through involvement of SHGs for skill development of tribal millet growers on millet production, storage, processing and value addition technology dissemination.
54. In order to promote conservation of indigenous cattle and fetch appropriate price for milk of Indigenous Cows for commercial prospective; it is recommended that the Department of Animal Husbandry should formulate an independent policy encouraging indigenous cattle rearing through involvement of the stakeholders; indigenous cattle owners, Maharashtra State Gau Seva Aayog, Dairy Co-operatives and indigenous cattle breed clubs.
55. As the FPOs are dependent on private agencies for services like custom hiring, storage, processing and value addition, etc.; to strengthen the FPOs, it is recommended that the members of these FPOs and young agricultural graduates should undertake trainings from SAUs and through adoption of university technologies, establish startups, self-employment ventures that provide such services.

Agricultural Economics/Stastistics

56. The finger millet growers can achieve higher benefit-cost ratio by investing in value-added products viz. Biscuits (1.77), Papads (1.82) and satv (2.03). Therefore it is recommended that the finger millet growers should focus on value addition for economic prosperity.
57. The farmers in Maharashtra earned gross returns of Rs. 1,95,170 crores and net returns of Rs. 21,722 crores from sugarcane variety Co 86032 released by MPKV, Rahuri during 28 years (1995-96 to 2022-23). Whereas, gross returns of Rs. 89,057 crores and net returns of Rs.10, 026 crores earned from sugarcane variety CoM 0265 during 15 years (2008-09 to 2022-23). An investment in sugarcane research and extension revealed 43 percent Internal Rate of Return (IRR). Therefore, it is recommended that the substantialfunds be provided for research and extension in sugarcane.

Biotic and Abiotic stress (2)

58. The chickpea genotypes **Phule G 1302-3-5** and **Phule G 1314-3-27** are resistant to *Fusarium* wilt disease and recommended as donors for *Fusarium* wilt resistance.

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