

Cite this article: Juno AM, Vennila MA, Janaki AR, Kokilavani S, Gangai RS. Climate-smart agronomic practices in millet systems: A review of productivity, adaptation and resource-use efficiency. Plant Science Today (Early Access). <https://doi.org/10.14719/pst.15076>

Supplementary Table 1. Database search strategy and screening process

Database	Search string	String No.	Records before filter	Records after filter	Duplicates removed	After year/language/doc type filter	After abstract screening
Scopus	"climate smart agriculture" OR "CSA" AND "millets"	1	38	38	0	17	10
Scopus	climate-smart technologies AND "millet" AND "yield"	2	3	2	1	2	1
Scopus	"climate-resilient agriculture" OR "climate adaptation" AND "millet" AND "income"	3	5	4	1	4	0
Scopus	("climate-smart agriculture" OR "CSA" OR "climate-smart farming") AND "millet" AND ("farmer" OR "cultivator") AND ("adopt" OR "technology adoption")	4	3	0	3	3	0
Scopus	("climate-smart agriculture" OR "CSA") AND "millet" AND ("yield" OR "productivity" OR "income" OR "livelihood")	5	25	0	25	25	0
Scopus	("climate-smart agriculture" OR "CSA")	6	9	0	9	9	0

	AND ("finger millet" OR "pearl millet" OR "foxtail millet" OR "kodo millet" OR "proso millet") AND ("yield" OR "income" OR "adoption")						
Scopus	("climate-smart agriculture" OR "CSA" OR "climate-resilient agriculture") AND "millet" AND ("resilient" OR "climate adaptation")	7	33	18	15	7	3
ScienceDirect	csa AND millets	–	10	7	3	7	6
Scopus	climate resilient technology AND "millets"	8	2	2	0	2	2
Scopus	("climate smart technology" OR "climate-smart agriculture" OR "climate resilient technology" OR "climate adaptation" OR "climate resilient practice" OR "CSA" OR "sustainable agriculture") AND ("impact" OR "adoption" OR "yield" OR "income" OR "productivity" OR "farm performance" OR	9	429	429	13	146	16

	"livelihood" OR "economic benefit*") AND ("millet" OR "millets" OR "pearl millet" OR "finger millet" OR "foxtail millet" OR "proso millet" OR "barnyard millet" OR "kodo millet" OR "little millet" OR "sorghum")						
Scopus	("climate smart technolog*" OR "climate resilient technolog*" OR "climate- smart agriculture") AND ("impact assessment" OR "yield" OR "income" OR "farm income" OR "economic impact" OR "production" OR "profitability") AND ("millet" OR "pearl millet" OR "finger millet" OR "foxtail millet" OR "proso millet")	10	29	29	29	0	0
Scopus	("climate smart agriculture" OR "climate resilient technology" OR "climate adaptation practice						

CSA: climate smart agriculture.

Stage	Records
Records identified	1229
Duplicates removed	172
Records after duplicates	1057
Records screened	401
Records excluded	321
Full-text articles assessed	80
Full-text articles excluded	0
Studies included	80

Supplementary Table 2. SMART classification across research domains

SMART criterion	SES (Socioeconomic)	CSA-AGR (Agronomy)	CSA-V (Varieties)	POL (Policy / institutions)	MOD (Modelling or decision support)
Water-SMART	Farmer water-scarcity perceptions; adoption constraints for water-saving tech	Tied ridges, infiltration pits, mulching, ridge-furrow, micro/supplemental irrigation	Varieties with improved transpiration efficiency	Water governance; irrigation investment; subsidy support	AquaCrop; DSSAT water balance; SWB models
Nutrient-SMART	Fertiliser affordability, knowledge gaps; adoption constraints	FYM, vermicompost, nano-inputs, microdosing, biofertilizers, split-N, INM	Genotypes with higher NUE	Fertilizer subsidy delivery; nutrient-extension packages	DSSAT N-cycle; HYDRUS-1D; nutrient-response models
Carbon-SMART	Household residue management behaviours	CA (no-till), residue retention, agroforestry, organic amendments	High-biomass genotypes	Carbon-incentive policies; INM extension	SOC models; carbon budgeting tools
Weather-SMART	Risk perceptions of drought / rainfall shifts	Sowing-date optimisation, transplanting, density management	Early/late maturing cultivars; drought-tolerant lines	Climate-risk adaptation policy	Climate scenario modelling; DSSAT climate impacts
Seed / Genetic-SMART	Varietal preferences; seed system bottlenecks	On-farm testing; participatory varietal trials	QTL/GWAS-based traits; stress-screened lines; omics	Seed system strengthening; varietal dissemination	G×E modelling; AMMI/GGE; cultivar targeting
Energy-SMART	Labour and mechanisation constraints	Conservation/reduced tillage; draught power; low-input agronomy	Input-efficient genotypes	Energy-efficient mechanisation policies	Energy-use modelling; mechanisation impact tools
Knowledge - SMART	Knowledge, ITK, training, awareness	Participatory evaluation; climate calendars; ITK integration	Farmer-led varietal selection	Extension prioritisation; capacity-building	Digital advisories; DSS-based targeting
System-SMART	Livelihood diversification; risk spreading	Intercropping, crop-livestock-fish	Multi-trait genotypes suited for	Integrated farming	GIS suitability mapping;

		systems, SCI, agroforestry bundles	diversified systems	system policies	landscape/syste m models
--	--	---------------------------------------	------------------------	--------------------	-----------------------------

ITK: indigenous technical knowledge; SCI: system of crop intensification; CA: conservation agriculture; NUE: nitrogen use efficiency; INM: integrated nutrient management; FYM: farmyard manure; CSA: climate-smart agriculture; SES: socio-ecological system; DSS: decision support system; SWB: soil water balance; DSSAT: decision support system for agrotechnology transfer; SOC: soil organic carbon; GIS: geographic information system; GN: grain number; QTL: quantitative trait loci; AMMI: additive main effects and multiplicative interaction; GGE: genotype and genotype $\times$ environment interaction.

Supplementary Table 3. Strength of evidence across SMART categories

SMART criterion	SES	CSA-AGR	CSA-V	POL	MOD
Water- SMART	✓✓	✓✓✓✓	✓	✓	✓✓✓
Nutrient- SMART	✓✓	✓✓✓✓	✓✓	✓	✓✓✓
Carbon- SMART	✓	✓✓✓	✓	✓	✓✓
Weather- SMART	✓✓✓	✓✓✓	✓✓✓	✓	✓✓✓
Seed / Genetic- SMART	✓✓	✓✓	✓✓✓✓	✓	✓✓
Energy- SMART	✓	✓✓✓	✓	✓	✓
Knowledge- SMART	✓✓✓	✓✓	✓	✓✓	✓✓
System- SMART	✓✓	✓✓✓✓	✓✓	✓✓	✓✓

SES: Socioeconomic; CSA-AGR: Agronomy; CSA-V: Varieties; POL: Policy / institutions; MOD: Modelling or decision support. ✓ = **weak presence (1–3 studies)**

✓✓ = **moderate presence (4–7 studies)**

✓✓✓ = **strong presence (8–12 studies)**

✓✓✓✓ = **very strong presence (13+ studies)**