

Supplementary Table 1 Agro-Climatic Zone (ACZ)-wise promising interventions for implementation by extension agencies based on AICRP-IFS-OFr and other studies

Agro Climatic Zone	Existing predominant farming system	Farming modules	Module wise suggested intervention*
Himalayan Region			
Western Himalaya	Crop+Dairy/Goatery/Poultry or Horticulture	Crop diversification/ Crop Improvement (CD/CI)	High-yielding variety /Fortified seed (Maize var.- Kanchan, Wheat var.- JAUW-672), micronutrient, Improved variety (Finger millet: VL 352, Wheat VL 967) and RDF in Finger millet
		Livestock Diversification/ Livestock Improvement (LD/LI)	Perennial grass (Hybrid Napier BNH Co-5) Cereal mixed with legume, De-worming drug (Albendazole Bolus, Suprazole), Calcium supplement, AI for breed improvement, Mineral mixture, bypass fat, and cow mat Azolla cultivation, Goatary-feeding management and Vaccination in goatry, Poultry - Rearing of poultry birds.
		Horticulture Diversification/ Horticulture Improvement (HD/HI)	Plantation of high-value horticulture plants (Kiwi, Plum, Apricot, Apple), IPM in Tomato and capsicum, Small Harvesting and pruning tools, Multi micronutrients
		Product Diversification (PD)	Ginger bread, ginger ale, ginger oil, ginger powder, and ginger candy, Vermicompost unit (vermibed), Preparation of kaladi for value addition, Value-added product of finger millet, Organic French bean packaging
		Capacity building (CB)	Mushroom cultivation, Waste recycling, NKG (Nutritional Kitchen Gardening)
Eastern Himalaya	Crop + Dairy + Goatery + Poultry + Fishery/Piggery	CD/CI	Introduction of HYV Ranjit, Introduction of toria after winter rice (TS-67), Rice-fallow utilization by (mustard, potato, maize, and lentil)
		LD/LI	Same as Western Himalaya for livestock Improve poultry/ duck Breeds (Banrajas and Chara Chambeli)
		Goatery	Improve breeds of Goats (Sirohi), Plantation of the tree-like drumstick (<i>Moringa oleifera</i> Lam) and Jack fruit (<i>Artocarpus heterophyllus</i>) on farm boundaries
		Fishery/ Piggery	Fisheries- Lime application to maintain pH, Local ingredients to reduce feed costs like rice, bran, mustard cake, or any other oilseed cake, chopped material of leguminous fodder crops Piggery- Feeding management (Kitchen and farm waste, rice bran and rice polish, wild Colocasia (stem/leaves/rhizomes), Tea waste, banana spadix, unripe banana, tapioca Jubili, Vaccination, iron supplements and monitoring for endo parasites
		PD	Making of Supari, Making of vermicompost
		CB	Vaccination of Goat and poultry
Gangetic Plain Region			
Lower Gangetic	Crop + Dairy + Goatery + Poultry/ Fishery	CD/CI	Improved rice varieties (CR Dhan 407, CR Dhan 508, CR dhan 518, CR Sugandh Dhan 908), Improved mustard varieties (TBM-204, NRCYS 05- 02, YSH 0401, 44 S 01), Sulphur application in mustard
		LD/LI	Same as Western Himalaya for livestock
		Goatery + Poultry	Goatery- Improve breeds of Goats, Plantation of the tree-like as Eastern Himalaya Poultry- Improve breeds of poultry,
		Fishery	Same as Eastern Himalaya
		PD	Oil extraction and mustard cake feeding
		CB	Training on vaccination in goat and poultry

Agro Climatic Zone	Existing predominant farming system	Farming modules	Module wise suggested intervention*
Middle Gangetic	Crop + Dairy + Vegetables	CD/CI	Short-duration rice variety (Sabour Harshit, Sabour Shree for paddy), to avoid delayed sowing of wheat/ Improved rice Variety, (NDR-3112), Improved wheat varieties DBW-187/ DBW- 222/DBW-327/DBW-371/ HD-3386, Improved mustard varieties RH-725/RH-761, Pulses for summer (green/black gram), Timely sown wheat variety Sabour Nirjal, Zero-till wheat cultivation, Balance use of fertilizers
		LD/LI	Same as Western Himalaya for livestock
		Vegetables	Zero-till potato cultivation, Nursery raising in tunnel
		PD	Puffed rice, chana dal badi, pop- corn, carrot and pea pickles
		CB	Grading of vegetables, Training on IFS, natural farming and zero-till wheat and potato, Seed treatment,
Upper Gangetic	Crop + Dairy + Horticulture	CD/CI	Improved rice Variety NDR-3112, Pusa 1847, Pusa 1885, Pusa 1886, Improved wheat varieties DBW-187/ DBW- 222/ DBW-327/ DBW-371/ HD-3386, Improved mustard RH-725/RH-7621, Red rot and top borer resistant sugarcane variety Co-0118, C0-15235, Co-98014, Co-14201 Pulses for summer (green/black gram), Balanced fertilizers
		LD/LI	Same as Western Himalaya for livestock and Gobhi sarso (GSC-7) as an intercrop with sugarcane
		HD/HI	Multi-nutrient mineral mixture, Application of oil cake per plant basis, Harvesting and pruning tools
		PD	Organic jaggery, Organic Sugar, Organic basmati rice, Puffed rice, chana dal badi, pop-corn, carrot, and pea pickles
		CB	Training on zero-till wheat, training on intercropping in trench method sugarcane sowing
Trans Gangetic	Crop + Dairy	CD/CI	Improved disease resistance rice variety PB1847, PB1885, PB1886, Herbicide-tolerant variety Pusa Basmati 1979 and Pusa Basmati 1985, Improved wheat/ varieties DBW-187/DBW- 222/DBW-327/ DBW-371/HD-3386 Improved mustard varieties RH-725/RH-761, Diversification by maize-mustard-moong/spring groundnut, Pulses for summer (green/ black gram), Balanced fertilizers
		LD/LI	Same as Western Himalaya for livestock
		PD	Basmati rice, puffed rice, chana dal badi, pop-corn, carrot and pea pickles
		CB	Training on zero-till wheat, Crop residue management, Importance of herbicide rotation, and right spray in delaying herbicide resistance
Plateau Region and Hills			
Eastern Plateau	Crop + Dairy/ Goatery/Poultry	CD/CI	Improved disease resistance rice variety JR-206, PB1847, PB1885, PB1886, Herbicide-tolerant variety Pusa Basmati 1979 and Pusa Basmati 1985, Improved wheat varieties JW-3288/ DBW-187/ DBW-222/ DBW-327/ DBW-371/ HD-3386, Improved mustard varieties RH-725/RH-7621 and Balanced fertilizers
		LD/LI	Same as Western Himalaya for livestock
		PD	Basamti rice, puffed rice, dal making, chana dal badi, pop-corn, carrot and pea pickles
		CB	Training on zero-till wheat, Crop residue management, Importance of herbicide rotation and right spray in delaying the herbicide resistance

Agro Climatic Zone	Existing predominant farming system	Farming modules	Module wise suggested intervention*
Central Plateau	Crop+Dairy/ Poultry	CD/CI	Improved varieties of Paddy - JR-206, JR-81, Wheat - Raj 4238, JW-3288, JW-3382, Arhar – Rajeshwari, Kodo – JK-137 and Kutki – JK-4, Maize- DHM 177, Papaya- Red leady 786, Improved mustard RH-725/ RH-761, Hybrid pearl millet, Orobanche root parasite management through low dose of Glyphosate and diversification by barley, Sulphur application in mustard
		LD/LI	Same as Western Himalaya for livestock Poultry -Introduce improved dual-purpose birds (Pratap Dhan)
		PD	Dal making, chana dal badi, pop- corn, carrot and pea pickles, Millets biscuits, laddu and barfi, Mustard oil extraction and use of mustard cake in animal feeding
		CB	Training on zero-till wheat and Orobanche root parasite management, CRM, Nutrient management in mustard
Western Plateau	Crop + Dairy/ Goatery/Poultry + Horticulture	CD/CI	Improved variety seed, Green gram – P Chetak , Chick pea – P. Vikram, Crop diversification (Linseed and Mustard), Vegetable crop as intercrop (Onion, Spinach, Chili etc) New variety (MAUS 158 / MAUS 162 / MAUS 612), Sorghum – Parbhani Moti, Pbn Shakti; Wheat – Phule Samadhan, Chick pea – BDNG 797, JAKI 9218; KNO ₃ spray, Rhizobium, PSB and KMB, IPM (NSKE, pheromone traps, trichoderma).
		LD/LI	Same as Western Himalaya for livestock Goatry- Improved breeds of Goats, Poultry-Improved poultry breed Azolla feeding, Plantation of the tree-like as Eastern Himalaya
		HD/HI	Fruit drop control (KNO ₃ @1% +GA/NAA @ 15 ppm), Supply of Sweet Orange seedlings of Katol Gold variety, Vegetable crop as intercrop in orchard
		PD	Bio decomposer for composting and Kitchen garden kit, Dal making, dal badi, Millets biscuits, laddu and barfi
		CB	Trainings on improved package of practices, value addition, seed treatment and IPM, Vaccination and deworming
Southern Plateau	Crop + Dairy/ Sheep + Horticulture	CD/CI	Improved varieties of paddy- KNM-1638/ RNR-15048, Pramod and DKC, Improved Soybean –Dsb-34, Rabi/summer groundnut as crop diversification in rice fallow or maize fallow
		LD/LI	Same as Western Himalaya for livestock Improved poultry breed- Swarnadhara Sheep- Improved breeds of sheep, Azolla feeding, Plantation of the tree-like as Eastern Himalaya, Vaccination and deworming table
		HD/HI	Multi nutrient mineral mixture and PGR spraying, Application of oil cake per plant basis, Harvesting and pruning tools, Fruit drop control (KNO ₃ @1% +GA/NAA @ 15 ppm)
		PD	Millets biscuits, laddu and barfi
		CB	Training on seed treatment, vaccination in sheep and IPM

Coastal Region

Agro Climatic Zone	Existing predominant farming system	Farming modules	Module wise suggested intervention*
East coast plains and hills	Crop + Dairy Goat/Sheep/ Poultry	CD/CI	Improved variety Hasanta, Kalinga Dhan 1401, RDF and micronutrients; IPM. Application of Boron (borax @ 10 kg/ha), IWM, Seed treatment (Mo @ 3 g/10 kg seed), Groundnut rich crop boosters, NKG
		LD/LI	Same as Western Himalaya for livestock and multicut fodder sorghum CO FS 32, Agathi, TANUVAS salt lick and velimasal Poultry- Improved poultry breed Swarnadhara Goatry- Mineral mixture Azolla for goat feeding, Drumstick plantation for goat feeding, Use of Hepatoprotective syrup, Deworming tablets
		PD	Millets biscuits, laddu and barfi, puffed rice, popcorn, different millet product
		CB	Training on seed treatment and IPM, vaccination and deworming
West Coast Plains and Hills	Crop + Dairy + Horticulture + Fishery	CD/CI	Short duration paddy Manu ratna' (100 day), Cowpea, Sesame in summer fallows Clean seed, Rouging, Stale Seed bed
		LD/LI	Same as Western Himalaya for livestock and bajra napier hybrid (var. Suguna), Establishment of Azolla bed
		HD/HI	IC cowpea var. Kanakamony 100 g per coconut basin, <i>Metarrhizium anisopliae</i> application to breeding site; neem cake and sand application to leaf axil; naphthalene balls and sand application to leaf axil; tuber: cassava (var. Vellayani Hraswa), elephant foot yam (var. Gajendra); spice: turmeric (IISR-Pragati); fruit: banana (var. Kanakamony), papaya (var. Red lady).
		Fishery	Fingerlings of strains: GIFT, Chitralada, Big Nin, Nam Sai Feed for fingerlings
		PD	Puffed rice, solar drying of copra, black pepper, nut meg
Other Region	Gujarat Plains and Hills	CB	Training on plantation crop/livestock management
		CD/CI	Improved varieties of soybean (NRC 37, JS 335), Need of crop diversification from sorghum to soyabean, Improved varieties of wheat (GW-451/ GW-513), weedicide application, seed treatment for termite control
		LD/LI	Same as Western Himalaya for livestock
		PD	Millets biscuit, laddu and barfi
		CB	Training on nutrient management in soybean and termite control in crops

*All listed interventions cannot be universally implemented. Their applicability should be assessed based on local agro-ecological conditions, community needs, and funding availability for the implementing agency. Extension agencies should prioritize interventions that align with the locality's specific challenges and resource constraints to ensure sustainable outcomes.