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Comprehensive Crop Diversification and Contingency Plan

1. General Information

Region	
Districts	Banka
Agro Climatic Region	III B-South Bihar Alluvial Plan

2. Agro-climatic profile

Parameter	
Weather/temperature (max/min)	45/9
Average rainfall (annual for last 5 year)	912.66

3. weather data (Last 5 years)

Month	Max Temp	Min Temp	Rainfall	Humidity	Sunshine hours
January-2021	28	4	0	69	
February-2021	32	8	0	64	
March-2021	38	16	0	57	
April-2021	42	18	12.5	49	
May-2021	40	20	151	65.5	
June-2021	39	21	249	69.5	
July-2021	36	25	296	78	
August-2020	36	26	201	79	
September-2021	36	25	104	78	
October-2021	35	18	179.8	66.5	
November-2021	30	12	0	63	
December-2021	28	8	11	64	
January-2022	21.7	10.5	10.3	79	
February-2022	23.2	10.2	28.6	72	
March-2022	35.6	17.1	0.0	62	
April-2022	39.6	24.6	0.0	60	
May-2022	35.8	23.5	57.1	72	
June-2022	36.6	25.9	110.3	75	
July-2022	35.4	25.9	92.7	78	
August-2022	33.8	25.4	100.08	81	
September-2022	32.9	24.7	250.6	86	
October-2022	31.6	20.6	108.5	79	
November-2022	28.8	13.2	0.0	69	

December-2022	25.1	9.2	0.0	70	
January-2023	18.5	9.4	0.00	80	
February-2023	24.4	10.2	0.00	65	
March-2023	34.4	16.9	17.24	50	
April-2023	39.7	23.9	11.14	45	
May-2023	36.8	24.5	37.15	55	
June-2023	36.5	25.8	67.42	65	
July-2023	34.8	25.5	116.30	78	
August-2023	34.0	24.8	250.04	80	
September-2023	32.7	23.2	285.64	75	
October-2023	31.1	19.5	108.20	65	
November-2023	27.9	13.1	0.00	60	
December-2023	24.2	9.3	12.98	70	
January-2024	21.7	9.0	0.00	70	
February-2024	25.5	11.2	0.00	60	
March-2024	35.5	15.5	0.00	50	
April-2024	40.3	24.75	0.00	45	
May-2024	37.5	25.0	73.77	50	
June-2024	37.0	25.0	39.76	65	
July-2024	35.2	27.5	312.32	78	
August-2023	36.5	26.5	236.62	80	
September-2024	34.0	25.0	268.54	75	
October-2024	32.35	18.5	47.40	65	
November-2024	28.5	14.5	0.00	60	
December-2024	25.0	9.5	0.00	68	
January-2025	0.00	27	0.00	80	
February-2025	0.00	30	0.00	75	
March-2025	1.65	36	1.65	60	
April-2025	80.60	43	80.60	55	
May-2025	58.31	41	58.31	65	
June-2025	189.18	42	189.18	70	
July-2025	251.62	38	251.62	85	
August-2025	203.51	35	203.51	80	
September-2025	3.62	35	3.62	85	
October-2025	65.31	34	65.31	78	
November-2025	0.00	31	0.00	72	
December-2025	0.00	26	0.00	75	

4. Soil condition

Soil Type	Area (ha)	pH	Organic Carbon	Major Constraints
Sandy Loam	46,000	6.5–7.3	0.30–0.50 (Low)	Low water-holding capacity, low organic matter, nitrogen deficiency, prone to drought
Loam	54,000	6.8–7.5	0.40–0.60 (Low to Medium)	Deficiency of nitrogen and phosphorus, declining soil organic carbon, moisture stress
Clay Loam	35,000	7.0–7.8	0.50–0.70 (Medium)	Poor drainage in lowlands, micronutrient deficiencies (Zn, B), occasional waterlogging
Red & Lateritic Soil (Southern uplands)	20,000	5.5–6.5	0.30–0.50 (Low)	Acidic nature, low fertility, low phosphorus availability, soil erosion, moisture stress

5. Irrigation Facilities

Source	Area/Number	Area (ha)	% Share
Canal	8	10,500	9.5%
Tank	445	8,200	7.4%
Bore Well	16043	82,700	74.8%
Lift Irrigation	66	9,200	8.3%

Note: Add rows, if needed

6. Major crops Statistics

Crop	Season	Area (ha)	Production	Productivity
Paddy	Kharif	99803	3418252.00	34.25
Maize	Kharif	838	32455.00	38.73
Pigeon pea	Kharif	789	7905.00	10.02
Horse Gram	Kharif	210	1925.00	9.17
Wheat	Rabi	37697	942425.00	25.00 (q/ha)
Chickpea	Rabi	2261	16143.50	7.14 (q/ha)
Lentil	Rabi	7644.70	58099.70	7.60 (q/ha)
Mustard	Rabi	5098	43485.90	8.53 (q/ha)
Maize	Rabi	2521	122092.00	48.43 (q/ha)
Maize	Summer	1435	75050.00	52.30 (q/ha)
Green gram	Summer	1623	12010.00	7.4 (q/ha)

Note: Add rows if needed

8 Cropping systems

Existing system	Area Covered	Constrains	Opportunities
Rice → Wheat	~55–60%	Erratic monsoon, limited irrigation, terminal heat during wheat	High-yielding varieties, zero tillage, laser land levelling, improved irrigation, residue management
Rice → Lentil/Gram	~10–15%	Residual soil moisture limitation, delayed rice harvest, low seed replacement in Lentil/Gram	Short-duration rice varieties, improved pulse varieties, seed treatment, mechanization
Rice → Mustard	~8–10%	Moisture stress after rice, aphid infestation	Improved mustard hybrids, supplemental irrigation, integrated pest management
Maize → Wheat	~8–10%	Water scarcity, fall armyworm, high input cost	Hybrid maize, micro-irrigation
Rice → Summer Moong	~3–5%	Lack of irrigation after wheat/rice, short growing window	Crop diversification, improved soil fertility through biological nitrogen fixation, additional farm income

9 Horticultural & Plantation

Crop	Area (ha)	Production (MT)	Productivity (MT/ha)
Mango	5,800	63,800	11.0
Guava	720	10,800	15.0
Jack fruit	480	7,200	15.0
Cauliflower	2,300	46,000	20.0
Cabbage	1,900	47,500	25.0
Tomato	2,700	67,500	25.0
Onion	1,150	20,700	18.0
Brinjal	2,100	52,500	25.0

Note: Add rows if needed

10 Livestock Resources

Species	**Male**	**Female**	**Total**
Indigenous Cattle	126266	521324	647590
Crossbred Cattle	3664	67882	71546
Buffalo	10628	101498	112126
Goat	73729	378635	452364
Sheep	-	-	8823
Pig	-	-	26384
Donkey	-	-	2
Horse	-	-	359
Others	-	-	198551

11. Poultry Resources

Types	Number of farms	Birds Population
a) Commercial	70 Registered farms	60000
b) Backyard	30000 Household	40000

Note: add rows if needed

12. Fisheries Resources

Types	Numbers/area	Production
a) Ponds	1,200 Hectares	3,800
b) Reservoirs	7 Large/Medium Units (3,099 Ha)	650
c) Village Tanks	190 Hectares	420
d) Water Spread Area	Dynamic (~200 Ha)	250
e) others	24+ High-Density Cages	120

Note: add rows if needed

13 Climate Risk Profile

Hazard	Frequency	Severity	Affected Area
Drought	Frequent (once in 2–3 years)	High	Entire district; most affected blocks include Chandan, Katoria, Bausi, Belhar, Phulidumar, Shambhuganj, and Banka
Heat Wave	Frequent (April–June)	High	Entire district, especially open agricultural areas
Cold Wave	Frequent (December–January)	Moderate	Entire district; severe impact on vegetables, pulses, and young livestock
Hailstorm	Occasional (February–April)	Moderate	Scattered areas across the district, particularly wheat and horticultural belts
Thunderstorm & Lightning	Very Frequent (Pre-monsoon and monsoon)	High	Entire district, especially hilly and open-field area

14. Economic losses Assessment

Factors	Crop Loss %	Livestock Loss %	Fisheries Loss %
Drought	40-50 %	15 %	20-25 %

15. Market & Value Chain Analysis

Commodity	Major Market	Demand Trend	Value Addition Potential
Paddy	Banka, Amarpur, Katoria, Bhagalpur	High and stable	Rice milling, branded rice, rice bran oil, rice flakes
Wheat	Banka, Rajoun, Bhagalpur	High	Flour (atta), semolina (suji), bakery products
Maize	Banka, Belhar, Bhagalpur	Increasing	Poultry feed, starch, corn flour, silage
Pulses (Lentil, Gram, Pigeonpea)	Banka, Bhagalpur	Increasing	Cleaning, grading, dal milling, packaging
Mustard	Banka, Amarpur	High	Oil extraction, mustard cake, branded edible oil
Mango	Banka, Bhagalpur, Deoghar	High (seasonal)	Pulp, pickle, squash, juice, dried mango products
Milk	Cooperative societies, local dairies, Bhagalpur	Increasing	Paneer, curd, ghee, khoa, flavoured milk
Goat	Local livestock markets, Deoghar, Bhagalpur	High	Meat processing, breeding, value-added meat products
Poultry	Local markets	Increasing	Processed chicken, eggs, hatchery development

16. Crop Diversification Opportunities

Existing Crop	Alternative Crop	Justification	Expected benefit
Rice (Paddy)	Maize	Requires less water, suitable for upland and medium lands, higher market demand	20–30% higher income, reduced water use, improved climate resilience
Rice (Paddy)	Pigeonpea (Arhar)	Drought-tolerant, suitable for upland rainfed areas	Improved soil fertility through nitrogen fixation,
Rice → Fallow	Lentil	Utilizes residual soil moisture during rabi	Additional income, improved soil health, increased cropping intensity
Rice → Fallow	Chickpea (Gram)	Well suited to light soils and limited irrigation	Higher profitability, nitrogen fixation, reduced fertilizer requirement
Wheat	Mustard	Requires less irrigation and matures earlier	Better water-use efficiency and higher net returns
Hilly Fallow Land	Horse gram	Well suited to hilly upland area	Increase cultivable area

17. Climate Resilient Technologies

Technology	Target Crops/System	Expected Outcome
Drought-tolerant crop varieties	Paddy, maize, pigeon pea	Stable yield under erratic rainfall and reduced crop failure
Short-duration crop varieties	Rice, maize, wheat	Escape terminal drought and heat stress; timely sowing of succeeding crops
Direct Seeded Rice (DSR)	Rice	Saves 20–30% irrigation water, reduces labour cost, enables timely planting
Zero Tillage	Wheat after rice	Timely sowing, reduced cultivation cost, improved soil moisture conservation
Laser Land Levelling	Rice–Wheat system	Uniform irrigation, 20–25% water saving, improved crop productivity
Micro-irrigation (Drip & Sprinkler)	Vegetables, fruits, maize	Water saving (30–50%), higher water-use efficiency, increased yields
Farm Ponds & Rainwater Harvesting	Rainfed farming systems	Supplemental irrigation during dry spells and groundwater recharge
Mulching	Vegetables, fruit orchards	Conserves soil moisture, suppresses weeds, moderates soil

18. Natural Farming Opportunities

Practice	Current Status	Scope for Expansion
Natural Vegetable Cultivation	Limited adoption in a few villages	High potential due to increasing consumer demand for residue-free vegetables
Jeevamrit & Beejamrit	Demonstration stage	High potential using locally available cow dung and cow urine
Crop Residue Recycling	Partial adoption	High potential to improve soil organic matter and reduce residue burning
Vermicomposting	Adopted by progressive farmers and SHGs	High potential for village-level compost production
Green Manuring (Dhaincha, Sunhemp)	Low adoption	High potential before transplanted rice to improve soil fertility

19. Water Use Efficiency Measures in Banka

Technology	Coverage	Potential Area
Drip Irrigation	Low (mainly vegetables and fruit orchards)	High in mango, banana, guava, vegetables, and other horticultural crops
Sprinkler Irrigation	Low to Moderate	High in maize, pulses, oilseeds, fodder crops, and upland fields
Direct Seeded Rice (DSR)	Very Low (demonstration stage)	Moderate to High in irrigated and medium-upland rice areas
Zero Tillage	Limited adoption	High in rice–wheat cropping system, particularly after paddy harvest
Farm Ponds	Limited	High in rainfed blocks such as Chandan, Katoria, Bausi, Belhar, and Phulidumar
Rainwater Harvesting Structures (Check dams, Percolation tanks)	Moderate in selected locations	Very High in hilly and undulating terrain for groundwater recharge

20. Nutrition Security Interventions

Intervention	Target Group	Expacted Impact
Nutrition Kitchen Gardens (Poshan Vatika)	Rural households, women, Anganwadi centres, schools	Year-round availability of vegetables and fruits, improved household nutrition, reduced micronutrient deficiencies
Promotion of Nutri-Cereals (Millets)	Small and marginal farmers, tribal communities	Diversified diets, improved food and nutritional security, climate-resilient farming
Backyard Poultry	Women SHGs, landless and marginal farmers	Regular supply of eggs and meat, improved protein intake, additional household income
Backyard Goat Rearing	Smallholders and tribal households	Better household nutrition through milk and meat, livelihood enhancement
Bio-fortified Crop Varieties (Rice, Wheat, Maize)	Farming communities	Reduced micronutrient deficiencies (iron, zinc, vitamin A), improved nutritional quality of staple foods
Mushroom Cultivation	Women SHGs, Rural Youths	Nutritious food source, additional income, employment generation

21. Emerging Technologies

Technologies	Application	Adoption Status
Drone-based Crop Monitoring and Spraying	Crop health assessment, pest and disease surveillance, precision pesticide application	Low – Limited demonstrations; adoption is in the initial stage.
ICT-based Agro-Advisory Services (Mobile Apps, SMS, WhatsApp)	Weather advisories, crop management, market information	Moderate – Increasing use among progressive farmers through KVK and State Agriculture Department.
Solar-powered Irrigation Pumps	Irrigation in rainfed and off-grid areas	Moderate – Adoption increasing under government subsidy schemes, particularly in water-scarce villages.
Micro-irrigation (Drip and Sprinkler Systems)	Water-saving irrigation for horticultural and vegetable crops	Low to Moderate – Adopted mainly in horticulture; considerable scope for expansion.
Climate-Resilient Crop Varieties	Drought tolerance, early maturity, stress resistance	Moderate – Improved varieties are being promoted through KVK and line departments.
Biofertilizers and Biopesticides	Sustainable nutrient and pest management	Low – Adoption is increasing but awareness and availability remain limited.
Farm Mechanization through Custom Hiring Centres (CHCs)	Access to tractors, seed drills, planters, and harvesters	Moderate – Expanding, especially among small and marginal farmers.
Precision Weather Advisory Services	Farm decision support based on localized weather forecasts	Low to Moderate – Available through IMD and KVK advisories; adoption is gradually increasing.

22. Contingency Plan - Drought

Situation	Recommended Action	Responsible Agency
Delayed onset of monsoon	Promote short-duration and drought-tolerant crop varieties; adjust sowing dates; increase millet and pulse cultivation	Krishi Vigyan Kendra (KVK), Banka, Department of Agriculture (DAO, Banka), Bihar Agricultural University
Early-season drought (after sowing)	Gap filling, resowing with contingency crops, life-saving irrigation, mulching	KVK Banka, Department of Agriculture, Minor Water Resources Department

Mid-season drought	Intercultural operations, weed management, moisture conservation, foliar nutrient spray, protective irrigation	KVK Banka, Department of Agriculture, ATMA Banka
Terminal drought (grain filling stage)	Harvest at physiological maturity, prioritize irrigation for high-value crops, promote fodder conservation	Department of Agriculture, KVK Banka, Animal Husbandry Department
Prolonged dry spell	Alternate crops (millets, pulses, fodder crops), water harvesting, community irrigation scheduling	Department of Agriculture, Minor Water Resources Department
Livestock stress due to heat and water scarcity	Provide drinking water, shade, mineral mixture, vaccination and veterinary care	Animal Husbandry Department, Veterinary Hospitals

23. Contingency Plan - Flood

Situation	Recommended Action	Responsible Agency
NA		

24. Contingency Plan – Head/Cold Wave

Situation	Recommended Action	Responsible Agency
Heat wave during crop growing season	Provide life-saving irrigation, adopt mulching, irrigate during early morning/evening	Department of Agriculture, KVK Banka, ATMA Banka
Heat stress in vegetable and horticultural crops	Install shade nets, increase irrigation frequency, apply organic mulch, avoid pruning during extreme heat	Horticulture Department, KVK Banka, Department of Agriculture
Heat stress in livestock	Ensure adequate drinking water, provide shaded shelters, avoid grazing during peak afternoon hours, supplement electrolytes and minerals	Animal Husbandry Department, Veterinary Hospitals, District Administration
Cold wave affecting rabi crops	Apply light/protective irrigation before frost, use straw or plastic mulch, avoid excess nitrogen application during cold spells	Department of Agriculture, KVK Banka, ATMA Banka
Cold wave and frost in vegetables	Cover nurseries with low tunnels or polythene sheets, smoke generation during severe frost, provide protective irrigation	Horticulture Department, KVK Banka
Cold stress in livestock	Provide warm and dry shelters, bedding materials, balanced feed, clean drinking water, vaccination and prompt veterinary care	Animal Husbandry Department, Veterinary Hospitals

25. Pest & Disease Contingency

Problem	Mitigation Strategy	Remarks
Rice stem borer	Regular field scouting, pheromone traps, balanced fertilizer use, need-based recommended insecticides	
Brown planthopper (BPH) in rice	Avoid excess nitrogen, maintain proper spacing, conserve natural enemies, apply recommended insecticides	
Rice blast disease	Use resistant varieties, seed treatment, balanced fertilization, timely fungicide application	
Fall Armyworm in maize	Pheromone traps, regular monitoring, biological control, timely insecticide application as per recommendations	
Pod borer in pigeonpea and chickpea	Bird perches, pheromone traps, biological control (NPV), need-based insecticide application	
Mustard aphid	Timely sowing, apply recommended insecticides	

26. Recommended Varieties

Crop	Variety	Duration	Special Trait
Rice	Sahbhagi Dhan	105–110	Drought tolerant, suitable for rainfed uplands
Rice	DRR Dhan 42	115–120	Drought tolerant, high yielding
Rice	Rajendra Sweta	120–125	High yielding, suitable for irrigated conditions
Maize	DHM 117	95–105	High yielding hybrid, drought tolerant
Maize	HQPM-1	100–110	Quality Protein Maize (QPM), nutritionally superior
Pigeonpea	Asha (ICPL 87119)	170–180	Wilt tolerant, stable yield under rainfed conditions
Pigeonpea	Bahar	170–180	High yielding, suitable for eastern India

27. District Action Plan

Activity	Timeline	Agency	Expected outcome
Pre-monsoon desilting of ponds, check dams and canals	March–May	Minor Water Resources Dept., Rural Development Dept., Panchayats	Increased water storage and groundwater recharge
Promotion of drought-tolerant crop varieties (paddy, maize, pulses, millets)	May–June	Department of Agriculture, Krishi Vigyan Kendra Banka, Bihar Agricultural University	Reduced crop failure under moisture stress
Timely distribution of quality seed and inputs	May–June	Department of Agriculture, Cooperatives	Improved crop establishment and productivity
Rainwater harvesting and farm pond construction	Throughout the year	MGNREGA, Rural Development Dept., Agriculture Dept.	Improved irrigation availability during dry spells
Promotion of micro-irrigation (drip and sprinkler	June–October	Agriculture Dept., Horticulture Dept.	Improved water-use efficiency and reduced irrigation demand
Soil moisture conservation (mulching, ridge-furrow, conservation tillage)	June–September	Agriculture Dept., KVK Banka	Better soil moisture retention and higher crop survival
Crop diversification to pulses, oilseeds and millets	Kharif & Rabi seasons	Agriculture Dept., ATMA	Reduced drought risk and improved farm income
Contingency crop planning based on rainfall	During delayed/deficit monsoon	Agriculture Dept., KVK Banka, IMD	Timely alternate cropping decisions and minimized yield loss
Promotion of integrated farming systems	Throughout the year	Agriculture Dept., Animal Husbandry Dept., Fisheries Dept.	Diversified income and increased livelihood resilience
Fodder production and fodder bank establishment	June–December	Animal Husbandry Dept.	Reduced livestock losses during drought

28. Monitoring Indicators

Indicator	Baseline	Target	Frequency

Cropping Intensity (%)	~145–150%	Increase to 160–165%	Annual
Area under Improved/Climate-Resilient Varieties (%)	~35–40%	>60% of cultivated area	Seasonal (Kharif & Rabi)
Area under Micro-Irrigation (ha)	Limited (<5% of irrigated area)	Increase by 20–30%	Annual
Area under Crop Diversification (ha)	Moderate	Increase by 15–20%	Annual