WATERSHED MANAGEMENT DIRECTORATE, UTTARAKHAND,

INDIA

UTTARAKHAND CLIMATE RESPONSIVE RAINFED FARMING PROJECT

(P179357)

ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK (ESMF)

[December 2025]

Contents

LIST OF ABBREVIATIONS

Dy.Dir	Deputy Director
DPMU	District Project Management Unit
ESA	Environment and Social Assessment
FF	Farmer's Federation
FGD	Focused Group Discussion
FIG	Farmer's Interest Group
GP	Gram Panchayat
GPRP	Gram Panchayat Resilient Plan
IEC	Information, Education and Communication
MDT	Multi Disciplinary Team
M&E	Monitoring & Learning
PD	Project Director
PME	Participatory Monitoring & Evaluation
PMU	Project Management Unit
RVC	Revenue Village Committee (Informal body at Revenue Village of suggestive/consultative nature)
RVC Proposals	Proposals made by RVC at level of revenue village
SHG	Self Help Group
UG	User Group
VLI	Village Level Institutions
VP	Van Panchayat
WAS	Women Aam Sabha
WMD	Watershed Management Directorate, Dehradun, Uttarakhand.
WWMC	Water &Watershed Management Committee

ICM- IPM

FFS	Farmer's Field School
FSI	Farming System Intensification
FYM	Farm Yard Manure
ICM	Integrated Crop Management
IPDM	Integrated Pest and Disease Management
IPM	Integrated Pest Management
IPNM	Integrated Plant Nutrient Management
IWM	Integrated Weed Management
STCR	Soil Test Crop Response
WHO	World Health Organizations
EFC	Environment Friendly Chemicals
TOT	Training of Trainers
NPM	Non- Pesticidal Management

Executive Summary

Project Objective

The World Bank will be supporting Watershed Management Directorate, Uttarakhand (WMD) in implementing the Uttarakhand Climate Responsive Rainfed Farming Project (UCRRFP). The objective of the project is to *Improve resilience of production system to make mountain farming emission competitive and profitable in selected micro-watersheds of Uttarakhand*.

Project Components

Component A- Developing Resilient and GHG Efficient Production Systems

This component aims to enhance productivity through land treatment and development, while increasing fertilizer efficiency, water productivity, and reducing GHG emissions. To this effect, the multi-expert task team at the district level will help in preparing micro plans that will be implemented in a phased manner. Commodity-specific advisories will be provided by the respective technical agencies with domain expertise. The component provides the foundation for the project to shift cultivation towards optimal input usage pattern, leading to reduced input costs and enhanced average income of farmers.

Component B – Science-Based Development of Resilient Spring-sheds

The objective of the component is to improve spring-shed efficiency by investing in (i) undertaking comprehensive catchment treatment around spring-sheds; (ii) improving quantity and stability of spring flows through drainage management; and (iii) increased volume of water stored for farm use in farm ponds. With technical inputs from consortia partners, this component will support enhanced participatory micro-watershed planning, incorporating spring-shed treatment; rehabilitation of degraded common land; and water harvesting/storage from improved spring flows. It will enhance water supply and reliability, ensuring more timely input with water budgeting for each crop, for improved farm productivity under Component A.

Component C- Enhancing Income Resilience through Agribusiness and Entrepreneurship

The objective of the component is to promote investments in agribusiness to increase the stability and diversity and thus resiliency of incomes of rural and agricultural households in the project area (designated micro-watersheds). This will be through value addition of farm-based produce and enterprise development, tapping into the State's rainfed areas' opportunities and relative strengths, also for the most vulnerable households, and tapping the surpluses from productivity gains and agriculture expansion arising resulting from Component A and B.

This component will make investments through three subcomponents: (i) Supporting Agribusiness Promotion Centers; (ii) Micro-Enterprise Development; and (iii) Income Generation Support for Vulnerable Groups.

Component D – Project Management, Monitoring & Evaluation, and Learning

The objective of this component is to (i) strengthen the institutions associated with the project; (ii) deliver effectively and efficiently project outputs in a timely and accountable manner with adaptive learning, and (iii) generate and disseminate cutting-edge knowledge on a range of issues related to climate-resilient agriculture.

This component will ensure a proactive and responsive project management and coordination, with well capacitated staff. A systemic management effort will also be made to institutionalize project developed approaches, partnerships, and systems. In addition, this component will create an institutional learning and sharing mechanism for mainstreaming resilient agriculture systems at all levels across the participating departments related to the project.

Component E: Contingent Emergency Response Component (CERC).
The project will include CERC with a zero allocation at project approval. This arrangement shall permit a rapid project restructuring should a disaster strike and allows the Bank to support recovery efforts quickly, if required.

Project Area

Uttarakhand Climate Responsive Rainfed Farming Project (UCRRFP) will be implemented in 06 hilly districts and 02 plain districts of Uttarakhand covering about 1200 villages and comprising of 56 Micro watershed clusters.

Environmental Baseline

Uttarakhand is located on the southern slopes of the Himalayan range, encompassing an area of 53,484 sq. km, of which 93% is mountainous and 65% is forested. The elevation ranges from 200 meters above mean sea level (a.m.s.l) in the Gangetic plains to over 7,800 meters a.m.s.l in the Himalayan ranges.The state is divided into two major administrative divisions: Garhwal in the northwest, which includes Chamoli, Dehradun, Haridwar, Uttarkashi, Tehri, Pauri, and Rudraprayag; and Kumaon in the southeast, which includes Almora, Bageshwar, Champawat, Nainital, Pithoragarh, and Udham Singh Nagar.

Soil
Uttarakhand features a variety of soils, all prone to erosion. In the north, soils range from glacial debris gravel to stiff clay. Moving south, brown forest soil, often shallow, gravelly, and rich in organic content, is common. The Bhabar area has coarse-textured, sandy to gravelly, highly porous, and largely infertile soils. In contrast, the Tarai region in the extreme southeast boasts rich, nutrient-dense clayey loams mixed with fine sand and humus, making it ideal for cultivating rice and sugarcane. While the Tarai region's soil is highly fertile, the hill regions face constant erosion due to steep slopes, resulting in reduced fertility.

The Tarai, Shivalik's, and Duns in general have alluviums that are fertile and productive suitable for crop production. In the hilly region of the state, the land is less fertile due to soil erosion on the steep slopes, compared with the fertile land in the plain regions. Poor to moderate soil fertility on the mountain slopes limits agricultural production and leads to productivity.
The soil primary nutrients (NPK) of Tarai region (2006), Uttarakhand (India) was found 0.121%, 0.003%, 0.013%,respectively. Similarly, the mean value of NPK of Hill region (2010), was found, 0.212%, 0.001%, 0.015%. This shows that the NPK percentage in Tarai and Hill region are very less as per Indian standards. So, this shows the poor soil health. Generally, farmers in the hilly regions tend not to use inorganic fertilizer; instead, they rely on composting and farmyard manure (FYM) to maintain fertility which may not be applied in required quantities.

Water Sources
Uttarakhand is rich in water resources, including glaciers, lakes, rivers, and other water bodies. However, there has been a general decline in these water resources across the state. Hydrological studies over the past decades have confirmed this diminishing trend and the worsening crisis. Several factors have contributed to decreased underground seepages, leading to reduced water availability and lower discharge in streams, as well as the extensive disappearance of springs (*naulas*), which are the primary water source for the region.

Uttarakhand a net annual groundwater availability of 2.10 billion cubic meters. The state has a total of 18 assessed blocks, out of which 14 are categorized as "Safe" (below 70% groundwater development) and 4 as "Semi-Critical" (between 70-90% development). The Groundwater development in the plain districts (Dehradun, Haridwar, Udham Singh Nagar, Nainital) is monitored, while mountainous areas, which constitute about 85% of the state, are not assessed due to the absence of groundwater structures.

Groundwater is primarily used for agriculture in the plain districts. The percentage of groundwater irrigation to the net irrigated area has been increasing, according to the Central Ground Water Board (CGWB).

Climate

Uttarakhand's climate varies from a subtropical monsoon type with mild winters and hot summers to a tropical upland type with mild and dry winters and short, warm summers. About 80% of the area's annual rainfall of 1,546 mm occurs during the Indian Summer Monsoon (June to September). The mid-latitude westerlies contribute to the winter snowfall, feeding numerous glaciers.

The northern, northwestern, northeastern, and western parts of the state are perennially covered with snow, ranging from 9.5% to 10.2% of the area. The state has a population of approximately 11.4 million people, with a density of about 189 people per square kilometer. Urban centers like Dehradun, Haridwar, and Nainital have experienced rapid growth due to migration and economic development.

Climate Change Vulnerability

The vulnerability assessment[1] conducted for the state, based on 11 indicators, showed the highest value of vulnerability for Garhwal (Pauri Garhwal) (0.716) and the lowest for Haridwar (0.340). The range of the Vulnerability Index (VI) was divided into three categories: relatively high vulnerability (0.590-0.716) {Pauri, Tehri, Almora, Dehradun, Rudraprayag, Bageshwar}, relatively moderate vulnerability (0.465-0.590) {Champawat, Pithoragarh, Uttarkashi, Chamoli, Nainital}, and relatively low vulnerability (0.340-0.465) {Udham Singh Nagar, Haridwar}.

Changing climate conditions are causing loss of livelihood capital, altering agro-livestock conditions, and leading to the emergence of invasive species. The agricultural sector, which employs the largest workforce proportion in the state, is most affected. While rapid migration contributes to this issue, climate change undoubtedly threatens livelihoods in forestry, agriculture, and livestock husbandry[2].

Around 78% of Uttarakhand's population resides in rural areas, and about 60% are engaged in agriculture. However, the agrarian sector is grappling with the impacts of climate change. The rising air temperatures, uncertain rainfall, and glacier retreats in Uttarakhand are exacerbating the situation. Consequently, the state is confronted with a multitude of challenges, including high susceptibility to extreme weather events and the depletion of essential ecosystem services[3].

Agricultural

The agriculture sector in the state continues to remain heavily depended on rainfall. The net Irrigated area in the State is 3.45 lakh ha. Out of which 85.83% is in plains and 14.17% are is in hills. The irrigation intensity in the State is 159% which varies between 155% in plains to 184% in hilly region[4]. With a total cropped area (GCA) around 11,00,000 ha and net area sown around 7,00,000 ha, the cropping intensity is 155% in Uttarakhand[5].

As per the Uttarakhand Agriculture Statistics Data 2016-17, 2017-18 and 2018-19, the average use of chemical based fertilizers i.e. Urea, DAP, MoP, SSP etc. in the state is 3,82,171 t. in a year (in both rabi and kharif seasons). The consumption of chemical fertilizers (2,67,114 t) is maximum in the plain district Udham Singh Nagar, i.e 70% of the state consumption and 91% of Kumaun reason's consumption. However, in another plain district Haridwar, the consumption is 79,325 t which is 21% of the average total state chemical

[1] Climate Vulnerability Assessment for Adaptation Planning in India Using a Common Framework, *Department of Science and Technology, Government of India*

[2] P Rautela, and B Karki, "Impact of Climate Change on Life and Livelihood of Indigenous People of Higher Himalaya in Uttarakhand, India." American Journal of Environmental Protection, vol. 3, no. 4 (2015): 112-124. doi: 10.12691/env-3-4-2.

[3] S. Rani and P. Tiwari (2024), Climate change vulnerability assessment for adaptation planning in Uttarakhand, Indian Himalaya; International Journal of Disaster Risk Reduction 114 (2024) 104938

[4] State Horticulture Mission, Department of Horticulture, Govt. of Uttarakhand

[5] Agriculture Statistics at a glance 2016, Directorate of Economics & Statistics, DAC&FW

fertilizers consumption in a year. Among hilly project districts i.e. Rudraprayag, Tehri, Uttarkashi, Almora and Pauri it ranges 0.0 t (Rudraprayag) to 932 t (Pauri) in a year.

The average use of agrochemical (pesticides, insecticides & weedicides) in the state is 404 t in a year in two cropping seasons. The consumption of agrochemicals (2,67,114 t) is maximum in the plain district Udham Singh Nagar, i.e 40% of the state agrochemical consumption. Among hilly project the average use of agrochemicals ranges 3 t (Rudraprayag) to 37 t (Uttarkashi) in a year[6].

Agro Climatic Zones

The state has different agro-climatic conditions, slopes and height. Details of Physiographic Zones and farming situations in the state are as under:

Table-I: Agro Climatic Zones in Uttarakhand

S.N	Zone	Farming situation	Soil	Rainfall (mm/year)	Districts	Principal farm produces and Livestock
1	Zone A up to 1000 M	Tarai irrigated	Alluvial	1400	U.S. Nagar, Haridwar	Rice, wheat, sugarcane, lentil, chickpea, rapeseed mustard, mango, Litchi, guava, peach and plums. Livestock: Buffalo and cattle
		Bhabar Irrigated	Alluvial mixed with boulders and shingles	1400	Nainital, Dehradun and Pauri Garhwal	Rice, wheat, sugarcane, rapeseed mustard, potato, lentil, mango, guava and litchi. Livestock: Buffalo and cattle
		Irrigated lower hills (600-1000M)	Alluvial sandy soil	2000-2400	Champawat, Pauri Garhwal, Dehradun, Nainital, Tehri Garhwal	Rice, Wheat, onion, chilly, peas, potato, radish, cauliflower, pulses, oilseeds, soybean, mango, guava, plums and peaches. Livestock: Buffalo and cattle
		Rain-fed lower hills (600-1000M)	Residual sandy loam	2000-2400	Champawat, Nainital, Pauri Garhwal, Dehradun, Tehri Garhwal, Bageshwar	finger millet, Maize, rice, wheat, pulses, mango, guava, plums and peaches. Livestock: Buffalo, cattle and goat
2.	Zone B 1000-1500M	Mid hills south aspect (1000-1500 M)	Sandy loam	1200-1300	Champawat, Nainital, Almora, Dehradun,	Rice, finger millet, wheat, potato, tomato, peas, cole crops, pulses, peach and plums.

[6] Agriculture Statistics Data 2016-17, 2017-18 and 2018-19, Agriculture Department, Govt. of Uttarakhand

S.N	Zone	Farming situation	Soil	Rainfall (mm/year)	Districts	Principal farm produces and Livestock
					Tehri Garhwal, Bageshwar	Livestock: Cattle, sheep & goat
3	Zone C 1500-2400M	High hills (1500-2400 M)	Red to dark	1200-2500	Pithoragarh, Almora, Chamoli, Bageshwar	Amaranth, finger millet, French-beans, Cole crops, potato, peas, peaches, plums, pear, apple and stone fruits. Livestock: Cattle, sheep and goat
4.	Zone D> 2400 M	Very High hills	Red to dark Black clay	1300	Pithoragarh, Chamoli and Uttarkashi	Amaranth, buckwheat, peas, Cole crops, apple and potato. Livestock: Sheep & goat

Source - State Horticulture Mission, Horticulture Department, Govt. of Uttarakhand

Social Baseline

1. State Demographic and Settlement Pattern

Uttarakhand is a predominantly rural and mountainous state, characterised by low population density and highly dispersed settlements. As per the 2011 Census of India, the total population stands at approximately 10.1 million, comprising 5.15 million males and 4.96 million females, with a sex ratio of 963 females per 1,000 males, slightly exceeding the national average.

A distinctive feature of Uttarakhand's rural landscape is the prevalence of small habitations. About 75–85% of villages have fewer than 500 residents, 17% have between 500 and 1,999, while only 2.7% have a population exceeding 2,000. This fragmented settlement pattern across rugged and ecologically sensitive terrain significantly affects service delivery and inclusion.

Key challenges include:

- Limited access to markets, agricultural inputs, and extension services due to poor transport infrastructure.
- Difficulty in emergency response and disaster preparedness, particularly during climate-triggered events such as floods and landslides.
- Limited coverage of basic social infrastructure, including healthcare, education, and irrigation facilities.
- Need of climate-adaptive services such as cold storage, veterinary support, and resilient agriculture systems, heightening exposure for small and marginal farmers.

These structural constraints contribute to livelihood fragility and diminish the adaptive capacity of rural communities to respond to climate-related shocks. Addressing these vulnerabilities project will ensure inclusive development planning, improved service delivery frameworks, and targeted interventions that emphasize on social inclusion, access to infrastructure, and climate resilience.

2. Literacy and Population Distribution

Uttarakhand reports a literacy rate of 79.6%, outperforming the national average of 74% as per the 2011 Census of India. This reflects relatively strong educational attainment across the state. However, there remains a pronounced gender disparity: male literacy stands at 88.3%, while female literacy is 70.7%.

The state's population is concentrated in the plains and mid-hill districts, where access to economic opportunities and public services is relatively higher. Notably, four districts—Dehradun, Haridwar, Udham Singh Nagar, and Nainital—account for over 60% of Uttarakhand's total population. When Tehri, Pauri, and Almora are included, this figure rises to only 81%, highlighting substantial spatial population imbalance.

Conversely, remote hilly districts such as Uttarkashi, Chamoli, and Pithoragarh exhibit lower population densities, ranging from 41 to 69 persons per square kilometre, starkly contrasted by Haridwar, which exceeds 800 persons per square kilometre.

3. Poverty Situation

Poverty in Uttarakhand remains concentrated in rural and geographically remote areas, particularly where access to basic services and economic opportunities is constrained. According to government estimates (2011–12), 11.6% of the rural population lived below the poverty line. The Multidimensional Poverty Index (2021–22) offers updated insights, indicating poverty rates of 10.84% in rural areas, 7% in urban centres, and 6.92% overall—reflecting gradual improvement but continued disparities.

Districts such as Chamoli, Pithoragarh, and Rudraprayag are having higher poverty rate, largely due to limited transport connectivity, scarce livelihood options, and inadequate access to health, education, and market infrastructure.

4. Employment and Livelihoods

Agriculture remains the primary source of livelihood for approximately 70% of Uttarakhand's population, yet farming is largely subsistence-based, especially in hill regions where landholdings are typically under one hectare. These small and fragmented plots pose challenges for economic viability, reducing income potential and making farming less remunerative.

Due to limited agricultural returns, many rural households rely on informal and seasonal labour markets to supplement incomes. The overall work participation rate stands at 38.4%, with comparatively higher engagement among Scheduled Tribes (45.4%) and Scheduled Castes (38.7%), underscoring the need for inclusive labour market interventions.

A prominent socio-economic trend is male outmigration from hill districts to urban centres in search of employment. This shift leaves women and elderly family members responsible for managing agricultural and domestic tasks—leading to increased labour burden on women, particularly in geographically isolated areas.

5. Scheduled Castes and Scheduled Tribes

In the Project area—covering a population of 368,016 across eight districts—Scheduled Tribes (STs) constitute a small but important demographic, with 5,059 individuals representing approximately 1.38% of the total project population.

Although overall representation is modest, districts such as Haridwar (12.13%) and Uttarkashi (2.95%) record relatively higher ST concentrations, largely due to communities like the Tharu, Buksa, and Jaunsari. The remaining districts, i.e. Almora, Pauri, Nainital, Rudraprayag, Tehri, and Udham Singh Nagar, each have less than 1% ST population.

State-wide, Scheduled Tribes account for approximately 2.9% of Uttarakhand's population, or around 2.9 lakh individuals. Major tribal groups include Tharu, Jaunsari, Buksa, Bhotia, and Raji, primarily residing in

remote and ecologically sensitive districts like Chamoli, Pithoragarh, Uttarkashi, Dehradun, and Udham Singh Nagar.

Despite exhibiting a relatively high labour force participation rate—notably among ST women (36.3%), compared to the state average of 26.7%—these communities face persistent development challenges. Key vulnerabilities include:

- Lower literacy levels, especially for women (female ST literacy at 63.9%, compared to the state average of 70.7%)
- Dependence on marginal agriculture and daily wage labour
- Limited access to quality education, healthcare, and employment services

In alignment with the World Bank's environmental and social standards the project will focus on targeted outreach, viable & culturally appropriate livelihood support, and improved service delivery to ensure equity, social inclusion and equitable benefit sharing for ST households.

The district wise Scheduled Castes and Scheduled Tribes population in the state, as per 2011 census is given in Table II.

Table II: SC and ST Population in Uttarakhand

District	Population			SC Population			ST Population			
	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	% of Total
Uttarkashi	305781	24305	330086	76875	3692	80567	3374	138	3512	1.06
Chamoli	332209	59396	391605	68000	11317	79317	9046	3214	12260	3.13
Rudraprayag	232360	9925	242285	46279	1400	47679	309	77	386	0.16
Tehri Garhwal	548792	70139	618931	94628	7502	102130	630	245	875	0.14
Dehradun	754753	941941	1696694	119123	109778	228901	101475	10188	111663	6.58
Garhwal	574568	112703	687271	109576	12785	122361	1952	263	2215	0.32
Pithoragarh	413834	69605	483439	109541	10837	120378	15915	3620	19535	4.04
Bageshwar	250819	9079	259898	69842	2219	72061	1874	108	1982	0.76
Almora	560192	62314	622506	140931	10064	150995	750	531	1281	0.21
Champawat	221305	38343	259648	41725	5658	47383	1084	255	1339	0.52
Nainital	582871	371734	954605	137906	53300	191206	5780	1715	7495	0.79
Udham Singh Nagar	1062142	586760	1648902	174919	63345	238264	117381	5656	123037	7.46
Hardwar	1197328	693094	1890422	307320	103954	411274	5249	1074	6323	0.33
Total	**7036954**	**3049338**	**10086292**	**1496665**	**395851**	**1892516**	**264819**	**27084**	**291903**	2.89

Source – Census 2011

Table III: SC and ST Population in UCRRFP areas

District	Households	Total Population	Scheduled Castes	Scheduled Tribes
Almora	11497	54024	14308	67
Pauri Garhwal	7159	29100	4615	21
Haridwar	5331	29875	4173	3625
Nainital	17649	86515	20480	109

District	Households	Total Population	Scheduled Castes	Scheduled Tribes
Rudraprayag	11127	50279	10006	29
Tehri Garhwal	8462	44791	6015	5
Udham Singh Nagar	6276	34022	6546	39
Uttarkashi	8317	39410	9909	1164
Grand Total	**75818**	**368016**	**76052**	**5059**

Source – Census 2011

6. Transhumant in Project Area

Transhumance and agro-pastoral systems are long-standing traditions in Uttarakhand, especially among communities like the Gujjars and Bhotiyas/Anwals. These groups move their mixed livestock herds—sheep, goats, buffaloes, and cattle—across vertical zones: settling in warmer lowlands during winters and ascending to alpine pastures in summer. This pattern is consistent across both Garhwal and Kumaon regions, where transhumance is not just a livelihood but a way of life deeply embedded in cultural and ecological rhythms. Within the UCRRFP project area, around 450–500 transhumant families comprising approximately 1,500 individuals move seasonally through districts like Nainital, Pauri, Tehri, Rudraprayag, and Uttarkashi, grazing nearly 81,000 animals. These families typically camp for six to ten days during their transit through village boundaries, sharing grazing lands and water sources with settled communities—leading to both collaboration and occasional resource conflicts.

In response, the project has developed a comprehensive Transhumant Action Plan (TAP) with both short- and long-term strategies aimed at improving the well-being and resilience of these mobile populations. Short-term interventions focus on providing livestock health services, breeding support, insurance awareness, and promotion of solar technologies during brief stopovers. Long-term strategies include support for semi-sedentary transhumants, especially Gujjars and Bhotiyas, who camp for three to six months. These measures involve scientific livestock rearing, income generation training (IGA), animal health interventions, and community awareness campaigns.

Recognising the heightened vulnerability of transhumant groups—due to limited access to public services, shrinking grazing lands, and rising climate stress—the project adopts a socially inclusive approach, identifying transhumants as a vulnerable group. By enhancing livestock-based livelihoods, improving service delivery, and establishing resource-sharing mechanisms, the project aims to strengthen climate resilience and promote harmonious coexistence between transhumant and resident populations.

7. Gender Issue

In Uttarakhand, women contribute over 70% of the labour in farming and allied activities—including sowing, weeding, harvesting, post-harvest work, and the collection of fodder and fuelwood. Despite their extensive contributions, this work is largely unpaid or poorly paid, and women continue to earn significantly less than men. Many travel long distances to forests to gather resources, exposing themselves to risks such as falls, injuries, and wildlife attacks. Between 2000 and 2022, the state reported over 1,000 deaths and 5,100 injuries resulting from human-wildlife conflict. As on average, about 35 people are attacked by leopards each year, and approximately 50% of the victims are women.

Land ownership among women remains notably low, with only 13.96% recorded nationally, limiting their access to formal credit and government support schemes. In rural Uttarakhand, just 27.8% of women

participate in the labour force, and the female literacy rate stands at 70.7%. Additionally, women's involvement in decision-making bodies—such as Farmer Producer Organisations (FPOs)—is limited, and they often miss out on capacity-building opportunities and training. The impacts of climate change, including crop failure, water scarcity, and diminished grazing lands, are placing further pressure on women's livelihoods.

Compounding these challenges, approximately 11% of households in Uttarakhand are headed by women. Many of these women face heightened vulnerability due to low incomes and minimal control over land and productive assets. Furthermore, 20.7% of rural households in the state are landless—significantly higher than the national average of 7.4%. These landless and women-headed households typically rely on daily wage labour or informal work, with limited or no access to credit, agricultural schemes, or secure livelihoods.

To ensure inclusiveness the project will focus the active integration of transhumant groups into project activities. This includes targeted support through training, access to resources, and mechanisms that promote safety and equity among these nomad groups. Such interventions will not only strengthen individual resilience but also enhance climate adaptation and sustainable development outcomes across the region.

8. Cultural Heritage and Livelihood Opportunities

Uttarakhand's cultural heritage is rich and closely tied to its Himalayan landscape, traditional lifestyles, and religious practices. The state's festivals such as Harela, Phool Dei, and Kandali reflect a deep connection with nature, agriculture, and forest traditions. Community life is based on shared values and collective participation, often seen through Van Panchayats, fairs, and local customs. Folk songs, dances, and rituals celebrate seasonal changes and environmental harmony. The state is also known for its many temples, pilgrimage routes, sacred groves, and heritage sites, many of which are located in remote or ecologically important regions that are part of the cultural identity of local communities. These cultural and environmental traditions offer significant potential to promote sustainable livelihoods, especially through agriculture linked to traditional crops, organic farming, forest produce, and eco-tourism. By building on this heritage, communities can preserve their identity while improving income opportunities in climate-resilient ways.

The Environmental and Social Management Framework (ESMF)

This Environmental and Social Management Framework (ESMF) has been prepared to identify the potential environmental and social risks and impacts of proposed Project activities and propose suitable mitigation measures to manage these risks and impacts. It maps out the Indian laws and regulations and the World Bank Environment and Social Standards (ESSs) applicable to the Project, and describes the principles, approaches, implementation arrangements, and environmental and social mitigation measures to be followed.

The potential environmental and social risks for project activities are identified as:

Environmental Risks and Mitigation Measures

The Uttarakhand Climate Responsive Rainfed Farming Project (UCRRFP) seeks to promote sustainable development by enhancing natural resource management, improving agricultural productivity, and fostering climate-resilient livelihoods. However, several environmental risks have been identified that may undermine ecological balance and long-term sustainability if not addressed through appropriate measures.

i. Over-extraction of Natural Resources

Unregulated extraction of soil, water, and forest resources has led to degradation of the local ecosystem. This includes excessive groundwater withdrawal, unsustainable harvesting of forest produce, and overuse of land for agriculture.

Mitigation Measure – The project promotes the adoption of best indigenous practices for resource management. These practices not only preserve ecological integrity but also generate local employment and protect cultural and aesthetic values. Where necessary, modern technologies may be introduced, provided they are environmentally sound and socially acceptable.

ii. Depletion of Traditional Water Sources

Traditional water sources such as naulas, dharas, and wells are drying up due to neglect, reduced recharge, and changing land use patterns.

Mitigation Measure – Restoration of these sources should be prioritised using a blend of traditional wisdom and scientific techniques. Source sustainability must be ensured before undertaking any other water-related development activity.

iii. Dependence on Forests for Fodder, Fuelwood, and NTFPs

Local communities continue to rely heavily on forests for daily needs such as fodder, fuelwood, and non-timber forest products (NTFPs), leading to pressure on forest ecosystems.

Mitigation Measure – Promotion of alternative energy sources like biogas, solar devices, and traditional water mills (gharats) will help reduce forest dependency. Plantation of multipurpose trees (providing fodder, fuelwood, fibre, fruits, and fertiliser – the 5 Fs) using endemic species will further support sustainable forestry.

iv. Human-Wildlife Conflict

Encroachment into forest areas and habitat fragmentation have increased incidents of human-wildlife conflict, affecting both livelihoods and safety.

Mitigation Measure – Plantation of wild fruit-bearing trees, native shrubs, and grasses under forestry activities will help create buffer zones and reduce conflict. These species also support biodiversity and provide fodder and fuelwood.

v. Use of Chemical-Based Agricultural Inputs

Excessive use of chemical fertilisers and pesticides has degraded soil health and polluted water sources.

Mitigation Measure – Organic farming practices should be promoted, especially for climate-resilient niche crops. This will improve soil fertility, reduce input costs, and enhance long-term sustainability.

vi. Low Productivity of Rainfed Fields

Rainfed agricultural lands often suffer from poor yields due to erratic rainfall, degraded soils, and lack of irrigation infrastructure.

Mitigation Measure – Introduction of high-value crops, horticulture plantations, and improved agronomic practices will help enhance productivity. Market linkages and agribusiness support will further improve income generation.

vii. Threats to Biodiversity

Loss of native species and introduction of exotic plants have disrupted local biodiversity and ecological balance.

Mitigation Measure – Afforestation efforts should prioritise native and endemic species over exotic ones. This will help conserve biodiversity and maintain ecological harmony.

viii. Unsustainable Technological Interventions

Technological solutions such as solar pumps or ropeways, if implemented without proper assessment, may pose environmental risks.

Mitigation Measure – All technological interventions must undergo thorough environmental and cost-benefit assessments to ensure sustainability and community acceptance.

ix. Women's Drudgery and Labour Burden

Women bear a disproportionate burden of manual labour in agriculture and household tasks, often without adequate support or recognition.

Mitigation Measure – Drudgery reduction interventions such as improved tools, energy-efficient devices, and time-saving infrastructure should be promoted to ease women's workload and enhance their participation in productive activities.

x. Unsustainable Stone Quarrying for Drainage Line Treatment

Construction of engineering structures in drainage lines often involves quarrying, which damages the landscape and affects water flow.

Mitigation Measure – All structures should be built using loose boulders and stones available naturally along the drainage line. Quarrying for stones at the site must be strictly prohibited to preserve the natural terrain and hydrology.

Social Risks and Mitigation Measures

The Uttarakhand Climate Responsive Rainfed Farming Project (UCRRFP) is expected to generate positive social outcomes by enhancing agricultural productivity, supporting climate-resilient livelihoods, and improving access to agribusiness opportunities. However, several social risks and challenges have been identified that require careful management to ensure inclusive and equitable outcomes.

i. Equity and Inclusion

There are risks of exclusion of vulnerable groups such as Scheduled Castes (SCs), Scheduled Tribes (STs), landless households, and women from project benefits. These groups may face barriers in accessing land-

based interventions, participating in planning processes, or benefiting from agribusiness and income-generating activities.

Mitigation Measure- To address these risks, the project includes provisions for targeted outreach, participatory planning, and livelihood support for marginalized groups. The formation of inclusive village-level institutions, such as Women Aam Sabhas and Revenue Village Committees (RVCs), is encouraged to ensure representation and voice in decision-making.

ii. Gender

Gender disparities in Uttarakhand's agricultural sector are significant. Female farmers earn less than half the income of male farmers, and female-headed households (FHHs)—which constitute 21% of households—are more likely to experience economic vulnerability. Structural barriers such as limited land ownership, restricted access to inputs, and weak market linkages constrain women's participation in higher-value agricultural activities.

Mitigation Measure- The project aims to narrow the gender income gap by targeting FHHs for catalytic support, including technical training, access to inputs, and procurement linkages. The results framework includes indicators to track progress in increasing farm income for FHHs, with a target of a 30% increase.

iii. Indigenous and Transhumant Populations

The project area includes Schedule Tribes and transhumant populations such as the Bhotiya/Anwal and Gujjar communities, who rely on seasonal migration and access to grazing lands. Project activities may temporarily restrict access to traditional routes or forest resources.

Mitigation Measure- A dedicated Indigenous Peoples Planning Framework, including a Transhumant Action Plan, has been developed to address these risks, including support for livestock health, extension services, and improved coordination with Gram Panchayats. The plan promotes awareness, safeguards traditional rights, and ensures that transhumant populations are not adversely affected by project interventions. Additionally, the framework ensures inclusion of Scheduled Tribes through focused livelihood support, improved access to services, and participation in community-level planning and institutions.

iv. Resource-Based Conflicts

The introduction of new infrastructure and resource management practices—such as afforestation, water harvesting, and pasture development—may lead to disputes over access and use, particularly in areas with shared or contested resources.

Mitigation Measure- These risks are mitigated through participatory planning, community agreements, and the establishment of rules for equitable resource sharing. Village-level institutions and user groups are encouraged to develop and enforce transparent norms for the use of common assets.

v. Occupational Health and Safety

Project activities such as earthworks, pesticide application, and agro-processing may pose occupational health and safety (OHS) risks to workers and community members. These include exposure to hazardous substances, physical injuries, and unsafe working conditions.

Mitigation Measure- The project promotes the use of personal protective equipment (PPE), training on safe practices, and adherence to Environmental, Social, Health, and Safety (ESHS) guidelines. Labor management procedures include provisions for worker safety, grievance redress, and compliance monitoring.

vi. Cultural Heritage

Uttarakhand is home to numerous sites of cultural, religious, and historical significance. While no direct impacts on known heritage sites are anticipated, there is a risk of inadvertent disturbance to undocumented or community-recognized cultural features during construction or land-use activities.

Mitigation Measure- The project includes a "chance finds" procedure aligned with national legislation and World Bank Environmental and Social Standard 8 (ESS8). Community consultations will help identify culturally sensitive areas, and project activities will be adjusted to avoid adverse impacts.

Vii. Gender-Based Violence (GBV) and Sexual Exploitation and Abuse (SEA/SH)

Although data on GBV in Uttarakhand is limited, national and regional trends suggest that women, particularly in rural areas, may face risks of domestic violence, workplace harassment, and limited access to support services.

Mitigation Measure- The project has assessed the SEA/SH risk as moderate. Mitigation measures include sensitization of project staff and communities, a code of conduct for workers, and the establishment of a SEA/SH-responsive grievance redress mechanism. These measures aim to create a safe and inclusive environment for all project participants.

Criteria for exclusion of sub-projects/activity

The fragile Himalayan watersheds face persistent threats from mass wasting, soil erosion, and ecological degradation. These challenges are largely driven by deforestation, unscientific agronomic practices, hydrological imbalance, and recurring natural calamities. In response, the project places strong emphasis on promoting activities that not only reduce negative environmental and social impacts but also enhance positive outcomes for local ecosystems and communities.

To safeguard the region's natural resources—including forests, water bodies, wildlife habitats, and the rights of indigenous populations—a clear set of exclusion criteria has been developed. These criteria are grounded in lessons learned from earlier watershed initiatives undertaken by the Watershed Management Directorate (WMD). Activities that are likely to cause adverse impacts on the environment or social fabric—such as those leading to deforestation, disruption of water sources, loss of biodiversity, or displacement of vulnerable groups—will not be permitted under the project.

During the planning phase, all proposals received from Revenue Villages will undergo an initial screening process. This will be conducted by a multidisciplinary team in collaboration with the Water and Watershed Management Committee (WWMC) of the respective Gram Panchayat. The screening will assess each proposed activity against the exclusion criteria to ensure alignment with the Environmental and Social Management Framework (ESMF). Activities that may result in negative environmental impacts will only be considered for implementation after conducting a limited Environmental Assessment (ESA) and adopting the recommended mitigation measures under the project.

Once the Gram Panchayat Resilient Plans (GPRPs) are finalised, the responsibility for implementing approved activities and ensuring compliance with safeguard measures will rest with local institutions including WWMCs, Revenue Village Committees (RVCs), User Groups (UGs), Farmer Interest Groups (FIGs), and Federations. Some of the activities that are restricted under the exclusion list include:

- Activities likely to cause damage to wildlife by setting fire, injuring wildlife, or involving indiscriminate felling of trees or indiscriminate removal of plant, animal or mineral produce from sanctuaries/national park and adjoining forest area.
- Any construction in protected areas or priority areas for biodiversity conservation, as defined in national law.
- Activities that have the potential to cause any significant loss or degradation of critical natural habitats, whether directly or indirectly, or which would lead to adverse impacts on natural habitats

- Activities that involve extensive harvest and sale/trade of forest resources (post, timber, bamboo, charcoal, wildlife, etc.) for large-scale commercial purposes
- Activities involving changing forestland into agricultural land or logging activities in primary forest
- Purchase or use of banned/restricted pesticides, insecticides, herbicides, and other dangerous chemicals (banned under national law and World Health Organization (WHO) category 1A and 1B and II pesticides)
- Activities that involve use of asbestos or asbestos containing materials
- Construction of any new dams or rehabilitation of existing dams including structural and or operational changes; or irrigation or water supply subprojects that will depend on the storage and operation of an existing dam, or a dam under construction for the supply of water
- Activities that involve the use of international waterways.
- Any activity affecting physical cultural heritage such as graves, temples, churches, historical relics, archeological sites, or other cultural structures.*
- Activities that may cause or lead to forced labor or child abuse, child labor exploitation or human trafficking, or subprojects that employ or engage children, over the minimum age of 14 and under the age of 18, in connection with the project in a manner that is likely to be hazardous or interfere with the child's education or be harmful to the child's health or physical, mental, spiritual, moral, or social development
- Any activity on land that has disputed ownership or tenure rights.
- Activities which require land acquisition or causing physical relocation.
- Activities which put permanent restrictions on access/ usage of resources.
- Any activity that will cause physical relocation of households or will require the use of eminent domain
- Any activity with significant environmental and social risks and impacts that would require an Environmental and Social Impact Assessment (ESIA)
- Any activity that will require Free, Prior and Informed Consent (FPIC) as defined in ESS7.

* *Activity that cause damage to cultural property, places of religious importance and restricted historical monuments should be excluded. Whenever there is a chance find of cultural or historical artefacts (moveable and immovable) the Department of Archaeology of the state Government, the Archaeological Survey of India will be informed. Should the continuation of work endanger the historical and cultural artefacts, the project work will be suspended until a solution is found for the preservation of these artefacts, or advice from the Archaeological Survey of India is obtained.*

Environmental and Social Management Plan

At the planning phase, the possible environmental and social negative impact of the proposed activities should also be considered during PRA exercises. If the WWMC proposed any activity in their GP plans, it should be ensured that the mitigation measures for the possible negative impacts have also been proposed for implementation. With accordance to the past experiences, all the possible negative impact and the mitigation measures thereof are annexed (Annex III -Negative impact, Annex II -ESCP) which shall be properly considered and incorporated in the plans during the PRA exercise/ GPRP prepration.

Participatory Rural Appraisal (PRA) is a community-based approach used to understand the local situation, including resources, challenges, and priorities especially those of the most marginalized people. It uses easy-to-understand tools and visual methods to gather information directly from villagers in an open and inclusive way.

Scope and Objectives of PRA:

- To build trust and strong connections with the community.
- To use local knowledge and people's lived experiences for better planning.

- To understand village layout, natural resources, farming practices, water sources, and housing.
- To identify problems and needs through community participation.
- To highlight environmental and social risks affecting village development.
- To prioritize development activities related to agriculture, water, and livelihoods.
- To analyze gender roles and understand the contributions of both men and women.
- To identify marginalized groups (like SCs, STs, landless, women-headed households) for focused support.
- To promote transparency, accountability, and community ownership in the planning process.

How PRA Supports ESMF Implementation:

PRA tools are closely linked with the Environmental and Social Management Framework (ESMF). For example:

- **Social and Resource Mapping** and **Transect Walks** help identify local resources, land use patterns, and community infrastructure—helping prevent risks like unequal access to land or water.
- **Wealth Ranking** and **Focus Group Discussions (FGDs)** help identify vulnerable households, reducing the risk of their exclusion from project benefits.
- **Gender Analysis Charts**, **Problem Trees**, and Women **Aam Sabhas** help recognize gender-related issues and ensure women's voices are included in planning.
- Forming community committees (like WWMC, RVC, PMEC) ensures fair participation and strengthens local governance.
- Designing the **Grievance Mechanism** through community input ensures people can raise concerns in a safe and accessible way.

Together, PRA activities help ensure the project is inclusive, fair, and sensitive to social and environmental risks making it an essential part of ESMF implementation.

Institutional Arrangements and Supervision of ESMF Implementation

The Government of Uttarakhand, through the Watershed Management Directorate (WMD), is responsible for implementing the Uttarakhand Climate Responsive Rainfed Farming Project (UCRRFP). The Project Management Unit (PMU), housed within WMD and led by the Project Director, has overall responsibility for project coordination, implementation, and monitoring, including the application of the Environmental and Social Management Framework (ESMF). The PMU is supported by two Regional Project Director Offices (Garhwal and Kumaon), District Project Management Units (DPMUs), and Field Implementation Units (FIUs) at the Gram Panchayat (GP) level.

Each DPMU is headed by a Deputy Director and staffed with multidisciplinary teams (MDTs) comprising specialists in agriculture, horticulture, forestry, animal husbandry, and engineering. These teams are responsible for facilitating the preparation and implementation of Gram Panchayat Resilient Plans (GPRPs), Spring shed Management Plan, Climate Resilient Farming Plan and ensuring compliance with the ESMF. The PMU includes dedicated experts for social development, climate resilience, and environmental safeguards, who provide technical oversight and capacity building support across all levels.
To ensure effective implementation of the ESMF, the following institutional arrangements are in place:

- At the PMU level, the Project Manager, with support from the Social and Institutional Development Expert, will oversee safeguard compliance, coordinate capacity-building activities, and provide guidance to field teams.
- The Deputy Directors at DPMU level will review and appraise all the GPRPs to ensure their alignment with the Environmental and Social Management Framework (ESMF), as well as the Indigenous Peoples Planning Framework (IPPF) and the Transhumant Action Plan."
- MDTs at the Field Implementation Unit (FIU) level will facilitate participatory planning, screen sub-projects for environmental and social risks, and support the integration of mitigation measures into GPRPs.
- Village-level institutions, including Water and Watershed Management Committees (WWMCs), Revenue Village Committees (RVCs), and village community especially women folk through Women Aam Sabhas, will be actively involved in the planning, implementation, and monitoring of safeguard measures under the project. During the planning phase, Participatory Rural Appraisal (PRA) exercises will be conducted to identify issues and finalize activities for the Gram Panchayat Resilience Plan (GPRP), including the proposals from Women Aam Sabhas to ensure the inclusion of women's priorities and concerns.

- In the implementation phase, community members, including those from these institutions, will participate directly for example, by contributing labour for the construction of water and soil conservation structures thus promoting ownership and long-term sustainability. These institutions will also engage in regular monitoring through scheduled meetings, tracking of work progress, labour participation, and verification of payments.

- Annual Social Audits, to be led by village-level committees, will ensure transparency, assess compliance with safeguard measures, and help address any grievances. This integrated approach will ensure that safeguard principles under the ESMF remain community-driven, locally relevant, and effectively implemented.

- The Participatory Monitoring and Evaluation Committees (PMECs) will be responsible for tracking the implementation of GPRP activities to ensure adherence to safeguard norms. They will maintain records of community feedback and ensure regular community engagement. An annual Social Audit will be conducted by the PMECs to verify whether the GPRP activities are being implemented in line with ESMF provisions. This will include field visits, consultations with beneficiaries, and reviewing documentation. In case of any non-compliance or grievances, PMECs will report the issues to the Gram Panchayat and Unit-level functionaries for redressal. The Social Audit findings will also be shared in *Gram Sabhas* to ensure transparency and community ownership.

Implementation Procedures

The ESMF is implemented in four stages:

1. **Sensitization and Training**: All project staff, community institutions, and transhumant groups are trained on environmental and social safeguards. The PMU develops training modules and IEC materials, while MDTs conduct field-level awareness sessions.
2. **Screening and Planning**: Sub-projects proposed during Participatory Rural Appraisal (PRA) are screened using exclusion and limited ESA criteria. Activities requiring further assessment are subjected to Environmental and Social Assessment (ESA), and mitigation measures are integrated into GPRPs, SMPs, CRFPs.

3. **Appraisal and Approval**: Draft GPRPs and Transhumant Action Plans are reviewed by the DPMU and PMU. If non-compliant, plans are returned for revision. Approved plans are adopted by *Gram Sabhas* and become the basis for implementation.
4. **Implementation and Monitoring**: WWMCs, with technical support from MDTs, will ensure implementation of the different plans (GPRP, SMP, and CRFP) at the village level, in close coordination with Gram Panchayats, user groups, Farmer Interest Groups (FIGs), Farmer Federations (FFs), and other community institutions. Women's participation will be ensured through dedicated Women Aam Sabhas, integrating their priorities in all stages. Community labour contribution, as beneficiary share will be mobilized for construction and conservation activities to strengthen ownership and sustainability. Marginalized households and transhumant families will be identified using PRA tools like wealth ranking and seasonal calendars and will receive need based support within the plan.

   Monitoring will be carried out through regular WWMC meetings, verifying progress, labour participation, and safeguards adherence. PMECs will conduct annual social audits, while division level experts will provide field support and compile reports. State level monitoring will be led by PMU through MIS and periodic reviews, enabling timely course correction and continuous learning.

5. **Capacity Building**

Capacity development is central to ESMF implementation. The WMD coordinates structured training programs for project staff and community institutions, covering regulatory requirements, safeguard procedures, and good practices. Training formats include orientation sessions, technical workshops, refresher courses, and exposure visits. The training calendar is aligned with project phases and tailored to the roles of different stakeholders.

Monitoring and Reporting

Monitoring of ESMF implementation is conducted at multiple levels:

- **Village-level Monitoring**: WWMCs and RVCs, monitor safeguard compliance during implementation. Participatory Monitoring and Evaluation Committee (PMEC) at village level will conduct social audit and support data collection and feedback.
- **Internal Monitoring**: DPMUs and Regional Directors oversee safeguard application using predefined indicators. The PMU consolidates monitoring data and ensures timely reporting.
- **External Monitoring**: Independent consultants conduct mid-term and end-line evaluations of ESMF implementation using approved tools and methodologies.
- **Key Indicators**: Monitoring includes metrics such as the percentage of GPRPs screened, staff trained, mitigation measures implemented, and eco-friendly practices adopted.

Any incidents related to environmental, social, health, or safety (ESHS) risks are reported to the PMU and escalated as needed. Corrective Action Plans are developed in consultation with relevant stakeholders and monitored for compliance.

Safeguard Implementation and Monitoring

The implementation of Environmental and Social Management Framework (ESMF) within the project is structured across four key phases: Planning, Implementation, Monitoring, and Audit & Learning. Each phase

outlines specific activities and standards to ensure that environmental and social safeguards are integrated at every level of project execution. The responsibilities are clearly distributed across the village level (Community Institutions and MDTs), Division level (DPD and subject experts), and PMU level, to ensure effective planning, execution, monitoring, and learning. The following table presents a phase-wise breakdown of activities, actors involved, and their respective responsibilities for mainstreaming ESMF standards within the project cycle.

Phase	Activity / ESMF Standard	Village Level (Community Institutions / MDTs at unit Level)	Division Unit Level (DPD, Subject Experts)	PMU Level
Planning	Screening of sub-projects, identification of social and environmental risks through PRA (as per ESMF)	• Social Facilitator, MDT facilitates PRA • Women Aam Sabha conducted separately • Identification of marginalized/Indigenous Households and Transhumant. • Risk screening and documentation	• Review and compile PRA findings • Technical vetting of screened activities. • Support MDTs/unit office in planning • Capacity Building	• Final review and approval of activities • Ensure safeguards are integrated in GPRP/SMP/CRFP
	Preparation of Gram Panchayat Resilience Plan (GPRP), SMP and CRFP with safeguard integration	• WWMCs, RVCs, Women Aam Sabha involved in plan finalization • Community priorities integrated including gender, labour, and vulnerable groups	• Quality check of plans • Consolidation of village plans. • MIS entry and monitoring readiness. • Ensure inclusion and alignment with ESMF norms	• Final review and approval of Plans. • Ensure safeguards are integrated in GPRP/SMP/CRFP.
Implementation	Safeguard Implementation (labour, gender inclusion, beneficiary contribution)	• Implementation of Labour Management Plan in relation to Community contributes voluntary labour (beneficiary share) • Ensure Women's participation in execution and oversight • Ensure Participation of marginalized households & support to transhumant.	• Ensure timely fund flow • Monitor adherence to safeguard processes	• Periodic review of safeguard execution • Generate learning for course correction
Monitoring	Monitoring of works, payments, and social/environmental compliance	• WWMCs, RVCs and PMECs track progress and safeguard indicators • Regular meetings and physical verification • Feedback from women and marginalized groups.	• Monthly monitoring visits • Compilation of reports from Unit offices.	• Analyze district-level reports • Suggest improvements for next phase
Audit and Learning	Annual Social Audit, Feedback Mechanism, Grievance Redress	• PMEC will conduct annual audit.	• Consolidate social audit findings.	• Ensure updates, findings and grievance are

Phase	Activity / ESMF Standard	Village Level (Community Institutions / MDTs at unit Level)	Division Unit Level (DPD, Subject Experts)	PMU Level
		• Grievance redress via village-level mechanism. • Share feedback and learnings during community meetings.	• Support grievance resolvance/ follow-up. • improve/adjust implementation as needed based on the Share feedback and learnings.	redressed well captured into reports, MIS. • Adjust strategy as per learning and feedback.

External Monitoring

External monitoring of the ESMF safeguard application shall be undertaken as part of the overall project Monitoring and Evaluation (M&E). An independent third-party agency, engaged for overall project M&E, will also be responsible for reviewing the implementation and compliance of ESMF safeguards across project components. The monitoring will be carried out on a sample basis and should align with key project milestones such as the Mid-Term Evaluation and Final Assessment.

The external agency may adopt its own tools and methodologies, but it is recommended that the assessment include methods such as field verification checklists, beneficiary interviews, focus group discussions, and review of MIS and project documentation. The agency should assess performance against relevant indicators related to social inclusion, grievance redressal, support to transhumant and marginalized groups, and overall safeguard compliance.

Findings from the external monitoring should be used to inform course correction, enhance implementation strategies, and strengthen overall project outcomes in line with ESMF principles.

Chapter-1

Introduction

Uttarakhand, encompassing the Kumaon and Garhwal Himalayas, covers an area of around 53,485 sq. km and approximately 11 million people are residing there. The state is divided into two administrative divisions - Garhwal and Kumaon - comprising 13 districts and 95 development blocks, with a multitude of villages and administrative units.

Altitude ranges from 200 m to over 8000 m above sea level, with distinct subdivisions like Outer Himalaya, Sub-Himalayan Siwalik belt, Lesser Himalaya, Great Himalaya, and Trans-Himalaya. Human settlements are prevalent up to 3500 m above sea level, with dense populations in the 1200-2000 m zone, leading to challenges in sustaining environmental resources due to increasing demands on land, forests, water, etc.

The rural economy and livelihoods in the state mostly rely on natural resources, supporting agriculture and catering to the needs of a 5.14 million livestock population for fodder. Forest cover varies across altitude zones: 45.80% of the total area is covered by forests, with different percentages across altitude zones.

Around 70% of the population depends on agriculture, but only around 9% of the total area is under cultivation, mostly rain-fed in hilly regions. Land holdings are small and fragmented, averaging 0.68 ha in the hills and 1.77 ha in the plains. Due to excessive extraction beyond the capacity to regenerate, natural resources are degrading. Forest-to-agriculture ratio is low, leading to soil erosion, declining land productivity, and water scarcity. The region faces increased risks from glacial melt, erratic rainfall, and extreme weather events, leading to frequent landslides and floods. These natural disasters significantly impact the local population, disrupting livelihoods and well-being. The Himalayan ecosystem, which provides essential services to the northern India such as water, carbon sequestration, and biodiversity, are under threat. Factors such as poverty, inadequate infrastructure, and limited adaptive capacity exacerbate the vulnerability of Uttarakhand to the adverse effects of climate change.

To address resource degradation, watershed management is crucial for conservation and sustainable development. Government of Uttarakhand has been implemented a number of watershed projects through Watershed Management Directorate (WMD) since last three decades. Projects, like the Uttarakhand Decentralized Watershed Development Project (UDWDP) phase-I & II were focused to reverse resource deterioration and support sustainable livelihoods to reduce pressure on natural resources.

1.1 Environmental and Social Management Framework (ESMF)

This Environmental and Social Management Framework (ESMF) is developed to support the environmental and social due diligence provisions for activities financed by the World Bank in the Uttarakhand Climate Responsive Rainfed Farming Project (UCRRFP). The project will support to *Improve resilience of production system to make mountain farming emission competitive and profitable in selected micro-watersheds of Uttarakhand* through; i)- constitute a consortium that will engage researchers/scientist from leading institute to handhold the project implementation, ii)- to build the climate resilient watersheds with the support of participating communities, watershed and spring-shed management interventions , iii)- the project will give both technical and farming inputs to the farmers in agriculture, horticulture, allied sectors and small ruminants to increase the productivity, iv) effort to strengthen the Agri-marketing systems of the farmers by organizing them into farmer's federations and by providing them value addition services, developing end to end supply chains and by making agro-logistics carbon neutral, in 06 hilly (Almora, Pauri, Nainital, Rudraprayag, Tehri and Uttarkashi) and 02 (Haridwar and Udham Singh Nagar) plain districts of Uttarakhand covering about 1200 villages and comprising of 56 Micro watershed clusters.. The Watershed

Management Directorate (PMU) will be implementing the Project activities through six District Project Management Units (DPMUs) under it.

This ESMF follows the World Bank Environmental and Social Framework (ESF) as well as the national laws [and state and local laws, if applicable] and regulations of India. The objective of the ESMF is to assess and mitigate potential negative environmental and social risks and impacts of the Project consistent with the Environmental and Social Standards (ESSs) of the World Bank ESF and national/state requirements. More specifically, the ESMF aims to (a) assess the potential environmental and social risks and impacts of the proposed Project and propose mitigation measures; (b) establish procedures for the environmental and social screening, review, approval, and implementation of activities; (c) specify appropriate roles and responsibilities, and outline the necessary reporting procedures, for managing and monitoring environmental and social issues related to the activities; (d) identify the staffing requirements, as well as the training and capacity building needed to successfully implement the provisions of the ESMF; (e) address mechanisms for public consultation and disclosure of project documents as well as redress of possible grievances; and (f) establish the budget requirements for implementation of the ESMF.

This ESMF should be read together with other plans prepared for the project, including the Stakeholder Engagement Plan (SEP), and the Environmental and Social Commitment Plan (ESCP).

1.2 Project Description

Uttarakhand being a hilly state, agriculture is pre- dominantly rain-fed and remains vulnerable to moderate to extreme weather conditions. Sustaining increased agriculture outputs in a rapidly changing climate will require adaptation at a faster pace. Enhancing food security while reducing GHG Emissions from farming practices will require transition to production systems that are more productive, use input more efficiently, have greater stability in outputs and are resilient to short- and long-term climate variability.

Uttarakhand Climate Responsive Rainfed Farming Project (UCRRFP) will be implemented in 06 hilly districts and 02 plain districts of Uttarakhand covering about 1200 villages and comprising of 56 Micro watershed clusters.

Result Indicators

The following Key Performance Indicators (KPI) are proposed for measuring the core outcomes of the project: -

- KPI 1: Increased water discharge in sample spring-sheds.
- KPI 2: Farmers adopting climate smart agriculture technologies and practices promoted by the project (CRI).
- KPI 3: Increase in productivity of selected crops.
- KPI 4: Reduction in GHG emissions from representative cropped land parcels (CRI).
- KPI 5: Farm Income at HH Level with / without UCRRFP.

1.3 Project Components

Component A- Developing Resilient and GHG Efficient Production Systems

This component aims to enhance productivity through land treatment and development, while increasing fertilizer efficiency, water productivity, and reducing GHG emissions. To this effect, the multi-expert task team at the district level will help in preparing micro plans that will be implemented in a phased manner. Commodity-specific advisories will come from the respective technical agencies having domain knowledge. The component provides the foundation for the project to shift cultivation towards optimal input usage pattern, leading to reduced input costs and enhanced average income of farmers.

Component B – Science-Based Development of Resilient Spring-sheds

The objective of the component is to improve spring-shed efficiency by investing in (i) undertaking comprehensive catchment treatment around spring-sheds; (ii) improving quantity and stability of spring flows through drainage management; and (iii) increased volume of water stored for farm use in farm ponds. With technical inputs from consortia partners, this component will support enhanced participatory micro-watershed planning, incorporating spring-shed treatment; rehabilitation of degraded common land; and water harvesting/storage from improved spring flows. It will enhance water supply and reliability, ensuring more timely input with water budgeting for each crop, for improved farm productivity under Component A.

Component C- Enhancing Income Resilience through Agribusiness and Entrepreneurship

The objective of the component is to promote investments in agribusiness to increase the stability and diversity and thus resiliency of incomes of rural and agricultural households in the project area (designated micro-watersheds). This will be through value addition of farm-based produce and enterprise development, tapping into the State's rainfed areas' opportunities and relative strengths, also for the most vulnerable households, and tapping the surpluses from productivity gains and agriculture expansion arising resulting from Component A and B.
This component will make investments through three subcomponents: (i) Supporting Agribusiness Promotion Centers; (ii) Micro-Enterprise Development; and (iii) Income Generation Support for Vulnerable Groups.

Component D – Project Management, Monitoring & Evaluation, and Learning

The objective of this component is to (i) strengthen the institutions associated with the project; (ii) deliver effectively and efficiently project outputs in a timely and accountable manner with adaptive learning, and (iii) generate and disseminate cutting-edge knowledge on a range of issues related to climate-resilient agriculture.
This component will ensure a proactive and responsive project management and coordination, with well capacitated staff. A systemic management effort will also be made to institutionalize project developed approaches, partnerships, and systems. In addition, this component will create an institutional learning and sharing mechanism for mainstreaming resilient agriculture systems at all levels across the participating departments related to the project.

1.4 Environmental and Social Policies, Regulations, and Laws

1.*4*.1 India: Legal Framework

Uttarakhand, the North-Indian state, is nestled in the Himalayas, faces unique environmental challenges due to its fragile landscapes, rich biodiversity, and vulnerability to climate change. In this context, existing legal frameworks serve as essential tools in addressing these challenges by regulating land use, protecting natural resources, particularly water, and promoting conservation efforts both in the state and across the country. India has established a robust legal framework encompassing various laws, regulations, and policies to safeguard the environment. These laws outline the rights, responsibilities, and obligations of individuals and the government concerning environmental conservation and preservation. Environmental laws and regulations aim to maintain ecological balance, prevent pollution, and promote sustainable development and promote sustainable development and judicious use of natural resources.

Table- 1.1- Applicable Environmental and Social Laws and Regulations

S. No	Act / Rules	Purpose	Applicable Yes/ No	Project Activity	Type of Permit	Authority
1	Environment Protection Act,1986	To protect and improve overall environment	Yes	NRM-SMC & DLT activities	_	MoEF, GoI, DoE, State Govt. CPCB, SPCBs
2	The Forest (Conservation) Act,1980	To check deforestation by restricting conversion of forested areas into non- forested areas	Yes	NRM, SMC, DLT & Agri-Horti activities	NOC for any activities in or near forest areas as applicable	Forest Department, State Government and Ministry of Environment and Forests, Government of India
3	Wild Life (Protection) Act, 1972	To protect wildlife through National Parks and Sanctuaries	No	NA	-	Chief Conservator Wildlife, Wildlife Wing, State Forest Department and Ministry of Environment and Forests, Government of India
4	Air (Prevention and Control of Pollution) Act, 1981	To control air pollution by controlling emission of air pollutants as per the prescribed standards.	Yes	Agribusiness/ processing	Consent to Establish (CtE) and Consent to operate (CtO) PUC for vehicles involved in transport	Uttarakhand SPCB
5	Water Prevention and Control of Pollution) Act, 1974	To control water pollution by controlling discharge of pollutants as per the prescribed standards	Yes	Agribusiness, processing	Consent to Establish (CtE) and Consent to operate (CtO)	Uttarakhand SPCB
6	The Noise Pollution (Regulation and Control) Rules, 2000	To regulate and control of noise producing and generating sources with the objective of maintaining the ambient air quality standards in respect of noise;	No	NA	Consent to Establish (CtE) and Consent to operate (CtO)	Ministry of Environment, Forest and Climate Change, Govt of India

S. No	Act / Rules	Purpose	Applicable Yes/ No	Project Activity	Type of Permit	Authority
7	Construction and Demolition (C&D) waste management rules	To manage C&D waste resulting from construction of Agri-park, ABC, Processing Centre, renovation of Govt. Offices, repairing of canal.	Yes	Agribusiness, Processing and value addition	C&D wastes (if any) to be diposed in pre-identified sites by PCB/local authority	Uttarakhand SPCB
8	Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010	Conservation of cultural and historical remains found in India	Yes	Construction of irrigation structures & ABGCS		Archaeological Dept. GoI, Indian Heritage Society and Indian National Trust for Art and Culture Heritage (INTACH).
9	National Forest Policy, 1988	To maintain ecological stability through preservation and restoration of biological diversity.	Yes	NRM, SMC, DLT & Agri-Horti activities	_Permission for removal of trees as applicable, compensatory replantation	Forest Department, State Government and Ministry of Environment, Forest and Climate Change, Government of India
10	Biodiversity Conservation Act, 2002	Federal legislation enacted by the Parliament of India for preservation of biological diversity in India, and provides mechanism for equitable sharing of benefits arising out use of traditional biological resources and knowledge.	Yes	NRM, Agri-Horti activities etc.	Support for conservaiton of traditional, native varities.	National Biodiversity Authority (NBA) Ministry of Environment, Forest and Climate Change

S. No	Act / Rules	Purpose	Applicable Yes/ No	Project Activity	Type of Permit	Authority
11	Uttarakhand Government Order #3408/X-2-2009-12(9)/2006 TC Involvement of Van Panchayat in Reserve Forest areas[7]	To involve Van Panchayat in soil and water conservation related activities within reserve forest areas.	Yes	SMC & NRM	_	Government of Uttarakhand
12	Solid Waste Management Rules 2016	To effectively tackle the issues of pollution and waste management. Fertilizer Control and to promote utilization of compost	Yes	Construction of irrigation and other structures. Agriculture /Agribusiness	Authorization under solid waste management rules for handling and disposal of waste generated.	Uttarakhand SPCB
13	Food Safety and Standards Regulation	To adhere to the guidelines on hygiene and sanitary practices set out by the Food Safety and Standards	Yes	Processing & value addition activities	FSSAI Registration and License for processing, packaging	Food Safety and Standards Authority of India (FSSAI)
14	The Insecticides Act, 1968 (Act No.46 of 1968)/ Insecticides Rules, 1971	To regulate the import, manufacture, sale, transport, distribution and use of insecticides with a view to prevent risk to human beings or animals, and for matters connected therewith.	Yes	Agriculture /Agribusiness	License for the sale, stocking, exhibition for sale, or distribution of pesticides	Central Insecticides Board and Registration Committees (CIB & RC) Ministry of Agriculture & Farmers Welfare, Govt of India/ Department of Agriculture & Farmers Welfare/ Directorate of Plant Protection, Quarantine & Storage.

S. No	Act / Rules	Purpose	Applicable Yes/ No	Project Activity	Type of Permit	Authority
15	The Seeds Act, 1966 (Act No. 54 Of 1966)	To provide for regulating the quality of certain seeds for sale, and for matters connected therewith	Yes	Agriculture, Horticulture, Agribusiness, Nursery establishment	License for selling, exporting, or importing seeds. License for seed business, including production, processing, distribution, or sale.	Ministry of Agriculture & Farmers Welfare, Govt of India/ Department of Agriculture & Farmers Welfare/ Directorate of Plant Protection, Quarantine & Storage.
16	Fertilizer (Control) Order, 1985 issued under the Essential Commodities Act, 1955.	To regulate the sale of fertilizers, liming materials, and trace element products in India	Yes	Agriculture, Horticulture, Agribusiness, Nursery establishment	A certificate of registration from the controller for sale of fertilizers	Deptt. of Agriculture Cooperation, Govt. of India
17	State Livestock Breeding Policy-2005	To improve genetic trait, conserve local breeds and income enhancement of livestock breeders through availability of improved breed animals.	Yes	Livestock activities	Carryout breed improvement activities as per the breeds listed in the policy	Animal Husbandry Department, Govt of Uttarakhand
18	The Uttarakhand Bovine Breeding Act, 2018 [Uttarakhand Act No. 19 of 2018]	To provide for improvement of bovines by regulating bovine breeding activities including use of bovine breeding bulls for production of bovine semen, processing, storage, sale, AI and any other breeding activity	Yes	Livestock activities	-	Animal Husbandry Department, Govt of Uttarakhand

The project will adhere to the applicable Environmental and Social Laws and Regulations listed in the tbale above.

1.4.2 National Environmental and Social Assessment

The Ministry of Environment, Forest and Climate Change (MOEF&CC) is the apex body for environment and pollution control, The Ministry of Labor and Employment (ML&E) is the apex body for occupational health and safety (OHS) with the Commissioner of Labour of Department of Labor and Employment, Government of Uttarakhand at the state level.

The major national policies, acts and rules relevant to all components funded by the project are the National Environment Policy (2006) and the Environment Protection Act (1986) for environment and pollution control; the National Policy on Safety, Health and Environment at Work Place (2009) for OHS; the National Policy on HIV/AIDS and the World of Work Report, 2014 of International Labour Organisation (ILO); and the relevant Covid-19 regulations and guidance in place. The above table (Table -1) gives a list of all relevant environment, health and safety acts and regulations and their applicability to the proposed project.

Under the Government of India's environment impact assessment (EIA) Notification 2009, the environmental classification of environmentally sensitive projects included in Schedule 1 is determined by MoEFCC, Government of India, and there are two possible outcomes:

Category A: A project is classified as Category A if it is likely to have significant negative impacts. Such projects require EIA, plus Environmental Clearance (EC) from MoEFCC;

Category B: A project is classified as Category B if it is likely to have fewer negative impacts and is listed in this category in the EIA Notification. These projects require EC from the State Environment Impact Assessment Authority (SEIAA) who classify the project as B1 (requiring EIA) or B2 (not requiring EIA) depending on the level of potential impacts. Projects classified as B2 require no further assessment.

As the union ministry for environment, forest and climate change (MoEFCC) has not specified requirement of any environmental clearance for the activities taken up under UCRRFP, no EC from the MoEFCC or SEIAA would be required for the proposed project.

1.*4.3 World Bank Standards and Key Gaps with the National Framework*

The project will follow the World Bank Environmental and Social Standards (ESSs), as well as the World Bank Group Environmental, Health and Safety Guidelines. Based on these policies, the environmental and social risk of the project is categorized as 'Moderate' risk category identified in the World Bank Environmental and Social Risk Summary (ESRS). The project will also adhere to the applicable environment and social regulations listed in the table 1.1.

The World Bank's environmental and social standards applicable to project activities are summarized below.

Table 1.2- World Bank's environmental and social standards applicable to project activities

Environmental and Social Standards	Key features	Key Gaps with the National/ State Legislation and addressing gaps

ESS1: Assessment and Management of Environmental and Social Risks and Impacts	• Identify, assess, evaluate, and manage environment and social risks and impacts, • Adopt a mitigationhierarchy: ➢ Anticipate and avoid risks and impacts, ➢ Where avoidance is not possible, minimize or reduce risks and impactsto acceptable levels, and ➢ Once risks and impacts have been minimized or reduced, mitigate and where significant residual impacts remain,compensate for or offset them, where technically and financially feasible ➢ Adopt differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable, ➢ Utilize national environmental and social institutions, systems, laws, regulations and procedures where appropriate, and ➢ Promote improved environmental and social performance in ways which recognize and enhance borrower capacity.	As per the MoEF&CC EIA Notification 2006, UCRRFP do not require any EIA or approval from MoEF&CC or USPCB. The WMD will ensure that the ESS1 provisions are implemented through contractors and monitored by E&S Specialists of PMU.
ESS2: Labor and Working Conditions	• Promote safety and health at the works, • Promote the fair treatment, non-discrimination, and equal opportunity of project workers. • Protect project workers, with emphasis on vulnerable workers • Prevent the use of all forms of forced labour and child labour • Support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national law • Provide project workers with accessible means to raise • workplace concerns	The national and state legal provisions cover almost all requirements in ESS2 and the requirements of a functional GRM for different types of workers. A Labour Management Procedures has been prepared and is a part of ESMF documents to regulate working conditions and management of labour relations including worker specific GRM, terms and conditions of employment, code of conduct, non-discrimination and equal opportunities, protection of labour force, prohibition of child/force labour and provision of OHS

		requirements. The main gap that LMP will cover is the OHS requirements of direct and contracted workers. The other gaps that the LMP fills are the provision of Code of Conduct for workers, GBV prevention measures, GRM for workers, etc. The PMU will ensure that the ESS2 provisions are implemented through Contractors and monitored by E&S Specialists of PMU. The concerned Labour Officers will also be monitoring these.
ESS3: Resource Efficiency and Pollution Prevention and Management	• Promote the sustainable use of resources, including energy, water and raw materials, • Avoid or minimize adverse impacts on human health and the environment caused by pollution from project activities, • Avoid or minimize project- related fugitive /stack emissions of short and long- lived climate pollutants, Collection and disposal of sewage and waste water from project activities, • Avoid or minimize generation of hazardous and non-hazardous waste, and • Minimize and manage the risks and impacts associated with pesticide use.	The majority of ESS3 requirements are directly addressed by existing regulations and indirectly for resource efficiency and climate change aspects, including pollution prevention and management. The appropriate mitigations and good practices will be promoted across the project interventions to promote resource efficiency and prevent pollution. The WMD will ensure that the ESS3 provisions are implemented through Contractors and monitored by E&S Specialists of PMU.
ESS4: Community Health and Safety	• Anticipate or avoid adverse impacts on the health and safety of project-affected communities during project life cycle from routine and non-routine circumstances, • Promote quality, safety and climate change considerations in infrastructure design and construction, • Avoid or minimize community exposure to project-related traffic and road safety risks, diseases, and hazardous materials, and have in place effective measures to address emergency events, and • Ensure that safeguarding of	These existing laws and rules are to protect community health and safety. Hence, these laws and rules fulfil the community health and safety requirements. The BIS standards and building codes address the community health and safety requirements.

	personnel and property is carried out in a manner that avoids or minimizes risks to the project- affected communities.	
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	• To avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement by exploring project design alternatives. • To avoid forced eviction. • To mitigate unavoidable adverse social and economic impacts from land acquisition or restrictions on land use by: (a) providing timely compensation for loss of assets at replacement cost6 and (b) assisting displaced persons in their efforts to improve, or at least restore, their livelihoods and living standards, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher. • To improve living conditions of poor or vulnerable persons who are physically displaced, through provision of adequate housing, access to services and facilities, and security of tenure • To conceive and execute resettlement activities as sustainable development programs, providing sufficient investment resources to enable dis- placed persons to benefit directly from the project, as the nature of the project may warrant. • To ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected	Not applicable to UCRRFP as there will not be any land acquisition and the project will not affect either rights or access to community lands/ forest rights.
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	• To protect and conserve biodiversity and habitats. • To apply the mitigation hierarchy and the precautionary approach in the design and implementation of projects that could have an impact on biodiversity • To promote the sustainable management of living natural resource • To support livelihoods of local	Provisions from the acts meet the ESS requirements. Codes of Practice are prepared as part of ESMF to address the wildlife presence and movement outside the protected area and in and around the sub-project locations.

	communities, including Indigenous Peoples, and inclusive economic development, through the adoption of practices that integrate conservation needs and development priorities.	
ESS 7: Indigenous people/ Sub Saharan African Historically Underserved Traditional Local Communities	• To ensure that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource- based livelihoods of Indigenous Peoples. • To avoid adverse impacts of projects on Indigenous Peoples/, or when avoidance is not possible, to minimize, mitigate and/or compensate for such impacts • To promote sustainable development benefits and opportunities for Indigenous Peoples in a manner that is accessible, culturally appropriate and inclusive • To improve project design and promote local support by establishing and maintaining an ongoing relationship based on meaningful consultation with the Indigenous Peoples. • To obtain the Free, Prior, and Informed Consent (FPIC) of affected Indigenous Peoples	The legislation meets the requirements of ESS, including FPIC. The WMD will ensure that the ESS7 provisions are implemented through itself and monitored by E&S Specialists of PMU. A plan for Indigenous /Transhumant is prepared and included in IPPF of the project.
ESS8: Cultural Heritage	• Protect cultural heritage from the adverse impacts of project activities and support its preservation. • Address cultural heritage as an integral aspect of sustainable development, • Promote meaningful consultation with stakeholders regarding cultural heritage, and • Promote the equitable sharing of benefits from the use of cultural heritage.	The legislation meets the requirements of ESS. The Chance Finds procedures are available in the legislation. The chance find procedures will be included as a Code of Practice.
ESS9: Financial Intermediaries	• Not applicable to UCRRFP	Not applicable

ESS10: Stakeholder Engagement and Information Disclosure	• Establish a systematic approach to stakeholder engagement that helps Borrowers identify stakeholders and maintain a constructive relationship with them, • Assess stakeholder interest and support for the project and enable stakeholders' views to be considered in project design, • Promote and provide means for effective and inclusive engagement with project- affected parties throughout the project lifecycle, and • Ensure that appropriate project information is disclosed to stakeholders ina timely, understandable, • accessible, and appropriate manner.	The legislation partly covers this ESS with the act requiring providing information when asked for. Almost all government agencies have GRM and Citizen Charters detailing the redressal and services. ESS 10 has the provision for borrower to respond to grievances of project-affected parties related to the environmental and social performance of the project in a timely manner as well as to proactively disclose publicly project related information

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1.5 Potential Environmental and Social Risk Impacts and Standard Mitigation Measures

At the planning phase, the possible negative impact of the proposed activities should also be considered during PRA exercises. If the WWMC proposed any activity in their GPRP, it should be ensured that the mitigation measures for the possible negative impacts have also been proposed for implementation. With accordance to the past experiences, all the possible negative impact and the mitigation measures thereof are listed here, which shall be properly considered and incorporated in the GPRP during the PRA exercise.

Table 1.3- Environmental and Social Risks and Mitigation Measures

Micro component Activity	Risks and Impacts	Mitigation Measures
FORESTRY • Afforestation (1000 plants/ ha.) • Fodder/Pasture Plantation • Assisted Natural Regeneration of Oak Areas	• Introduction of exotic species. • Proliferation / dominance of invasive / exotic species **Social** • Conflict among user over resource sharing • Shortage of grazing land during initial phase. • Restrict rights of the people	• All plantation activities will be done in accordance with Manual of Forestry. • Preference will be given to the local endemic species for plantation. • To increase the availability of local fodder/fuel, agro-forestry practices will be promoted. • Van Panchayats and Biodiversity groups in the GPs will be mobilized to ensure a higher sense of ownership and commitment towards sustainable management of common forest lands. • Equal sharing of resources among users by rules/regulation.
AGRICULTURE/ HORTICULTURE • Support for Climate Resilient Agriculture Production Systems	• Loss in soil moisture • Loss in soil fertility (Nitrogen, Carbon, etc.). • Soil & water pollution, contamination on food items and health hazards due to use of chemical fertilizers and pesticides.	• High nutritional value traditional crops will not be totally replaced by high yielding varieties. • To maintain soil fertility, crops rotation and bringing the cultivated land under leguminous crops (pea, lentil etc.) will be practiced. • To maintain biological fertility of the soil,

• Support for Climate Resilient Horticulture Production Systems • Support for Conversion/Diversification of Submerged Paddy Cultivated Lands	• More demand of water for irrigation and competing demands on surviving/existing sources which are used for drinking. • Wastage of water due to inefficient irrigation methods and practices • Pressure on local forests/ vegetation for fodder for animals • Due to monoculture chances of crop failure due to frost/fog, insect/pest and diseases. • Possibility of loss of local races/cultivars/gene pools/ crop varieties Issues with disposal of plastic mulch Social Loss of traditional / indigenous practices of crop cultivation. • HYVs are labour intensive and bring more workload on women. • Marginal groups (landless farmers/labourers) will benefit less, since they do not have land to bring under HYVs Discontinuation of barter system and more dependency on external resources / agents and, therefore, loss of self-dependency. Conflicts among the neighboring farmers due to the shade caste from vegetative field boundary	planting of nitrogen fixing species on the crop field bunds will be done. • Promotion of use of organic manures, green manures and biofertilizers will be promoted. • Soil test based fertilizer application will be promoted. • Selection of low water demanding (high efficiency in water utilization) HYV crops will be given preference. • Water conservation measures will be taken up • Micro irrigation methods will be followed • Protected cultivation (use of polyhouse, polypit, polytrench, etc.) to reduce the chances of HYV crop failure. • Will promote natural mulch and will ensure safe disposal of plastic mulch. - Follow the ***Environmental and Social Codes of Practice (ESCPs) included in Annex -II*** • *To retain soil health and reduce soil contamination & water pollution, use of bio-fertilizers (bio-compost, vermicompost, organic mulch (Green manure), microbial inoculants, etc.) and bio-pesticides should be promoted.* • *Use of permissible chemical pesticides* will *only be done in accordance to the application timings and safety measures mentioned in IPM strategy of the project.* • *The farmers applying pesticides* will *be trained on Codes of Practices to be adhered to while using the pesticides (precautions in mixing and applying, use of PPE, first aid etc)*
WATER HARVESTING • HDPE Irrigation Pipelines • Irrigation Tanks • Small Water Storage/Harvesting Tanks • LDPE Tanks	•Water logging due to improper drainage. •Water pollution through deposition of waste materiel due to public use.	• Rain water harvesting and storage of surface water (of streams, nalla, etc.) through water storage ponds/pits will be encouraged. • Construction of small Water Harvesting Tank will help to collect rain water for domestic uses and kitchen gardening.

• Pre Fabricated Geo Membrane Water Harvesting Tanks • Village Irrigation Ponds	•Disposal of excavated earth during construction • Removal of tress for excavation •Pollution through Polyethylene/ plastic waste by the use of LDPE sheets and plastic pipelines for water harvesting. •Health impacts due to breeding of mosquitoes. •Mud formation/ Silting along the water distribution points •More chances of water borne diseases if the unclean water is consumed without treatment •Seepage/leakage in roof tops and under water tanks. •Drawing of underground water may lead to depletion of ground water table. **Social** •Disputes over water sharing (domestic demand vs irrigation demand) may arise. •Marginal farmers are deprived from the benefits as they have small holdings.	• Excavated earth will be used for bund formation and replantation of trees will be taken up. • In rainfed areas, Low Density Polyethylene Tanks will be encouraged to collect rain/source water for irrigation. • Regular disinfection by chlorination and use of filters in storage structures will reduce chances of water borne diseases. • Proper designing, size and site selection for channel should be ensured. • Construction of smaller underground tanks to reduce chances of leakage. • Deep wells may not be dug to reduce drawing of underground water. • Disposal of waste water away from the ponds and proper drainage • Rules and regulations over sharing and rational use of water to be framed by the stakeholder communities. • Selection of site for community water storage tanks should be as per the convenience and cooperation of stakeholders to reduce conflicts among users. • Construction of water harvesting or water supply structure in individual and community land should be done only with the consent and the approval of the beneficiaries and Gram Panchayats.
LIVESTOCK • Support for Climate Resilient Production Systems (Small Ruminants/Poultry/ Fisheries/others) • Livestock nutrient management related activities	•Introduction of exotic/alien species of grasses and fodder crops to meet the demand of fodder, that dominate the local species. •Level of feed intake, type of carbohydrate in the diet and feed processing for cattle can increase the methane (GHG) emission. •Cross bred animals are more prone to diseases. •Exotic/cross breed animals require more provisions for health care.	• Native breeds to be promoted to the extent possible. • Animal health camps will be organized under supervision of technical experts. • Farmers will be encouraged for periodic vaccination to protect livestock from epidemic diseases. • To treat livestock, use of herbal medicines (ethnoveterinary care) should be encouraged. • Local fodder crop/ grass species will be encouraged. • Use of organic manure/bio-fertilizers will be encouraged for fodder crop production • To reduce biotic pressure on forest, farmers should be encouraged to adopt new livestock techniques, like stall feeding, native breeds, breed

	• Limited breeding facility (a bull can serve only 2 animals in a week) in case of hybrid animals. • Cross bred/exotic breeds animals require intensive care attention. • Improper treatment of grasses or straw might lead to food poisoning. • Dependency on professionals in the artificial insemination and other activities and in the absence of professionals quality of service will deteriorate. • Poor quality vaccination and Bio-medical wastes may increase the out-break of diseases. • Increase in GHG emission due to Enteric fermentation: The process in which methane is produced in the rumen of cattles. • Open disposal/heaping of manure will lead to unsanitary conditions, emissions. **Social** Vulnerable families may not have access to professional services.	improvement, improve fodder production etc. • Ration balancing will be followed to reduce methane emissions • Manure will be composted in pit methods
INCOME GENERATING ACTIVITIES (IGA) Potential IGAs- 1.NTFPS 2.Decorative items 3.Wood craft 4.Bamboo products 5.Nursery 6.Mushroom 7.Beekeeping 8.Fish farming 9.Woollen products	• Chances of excessive harvest of a particular species / plant parts or any other natural resources/raw materials • Destabilization of stabilized slopes dug to remove soil for cultivation. • More demand for water for many IGA activities. • Risk of food poisoning due to lack of awareness in making processed products. • Water pollution due to processing activities. • Possible occupational health hazards during processing activities.	• Strengthening of village resource management institutions to reduce conflicts among the users over common resources • Prohibited use of species to avoid over exploitation. • Sourcing necessary permits from Forest Department for collection/transit of NTFPs where applicable • Food safety protocols and Licenses will be in place • Any wastes from processing will be recycled/reused/disposed safety • Use of water saving techniques / water harvesting to meet demand of water in IGA activities. • Awareness among the users and proper training will help the users in mushroom and fish farming activities. • Follow ESHS guidelines where applicable

	• Worker safety aspects involved in collection, processing Social • Conflict among the users over common resources • Chances for economic risk due to taking up of new IGA.	• Processing of wool washing not be done directly in water sources. • Use of masks or nose cover (cloth) during wool processing.
AGRIBUSINESS 1-HYV cultivation 2-Polyhouse 3-Aggregation/ Processing 4-ABGCs	• Increase in use of chemical pesticides/ insecticides. • Threat to local or existing crops/species/gene-pool. • Exploitation of local shrubs and tree branches for staking purposes for some cash crops like climbers and tomato cultivated for commercial purposes. • Spread of organic/inorganic waste like fruit peel, seeds, pulp and poly sheets etc. • Use of additives, preservatives • Monoculture (of a particular Species or variety) results in decreased disease & pest resistant. • Air and water pollution by food processing units due to emissions and release of wastes. **Social** • Income loss due to crop failures. • Threat to nutritional security of the area.	• Promote non-chemical fertilizers and pesticides • Use of hardy local improved varieties for cultivation will reduce the use of chemical fertilizers and pesticides. • Cultivation of improved local varieties to reduce threat on local gene pool. • Use of alternate non-wood staking material. • Use of bio-products for packaging • Safe disposal of organic and inorganic waste separately, through composting/recycling/safe disposals after treatment • Crop diversification and intercropping according to market requirement and as natural pest barrier. • Proper pollution control arrangements in food processing units. Use only permitted additives, preservatives etc. Obtain FSSAI license as applicable. • The FIGs/ FFs, which will be responsible to run the processing unit/grading center, should have an agreement prior to establishment/construction of such unit with GP or individual (as applicable), to whom the land will belongs.
Social Safeguard Challenges	• Equity and Inclusion • Gender disparities • Indigenous and Transhumant Populations • Resource-Based Conflicts • Occupational Health and Safety • Cultural Heritage • Gender-Based Violence (GBV) and	• Ensure outreach and participatory planning; form inclusive institutions like WWMC, RVCs and Women Aam Sabhas. • Provide targeted support to WHHs through training, input access, and income enhancement strategies. • Implement IPPF and Transhumant Action Plan ensuring inclusion, rights awareness, and access to services. • Use participatory planning and community agreements to establish

	Sexual Exploitation and Abuse (SEA/SH)	fair and transparent resource-sharing norms. • Enforce PPE use, training, and ESHS standards through Labor Management Procedures. • Apply “chance finds” procedures and engage communities to avoid impacts on known and unknown heritage sites. • Implement code of conduct, SEA/SH-sensitive grievance mechanisms, and community/staff sensitization sessions.

Chapter- 2

ENVIRONMENTAL AND SOCIAL GUIDELINES

The environmental and social guidelines would promote the ability of communities to select a package of sub-projects and activities which will not only minimize or mitigate the negative environmental and social impacts but also enhancing the positive impacts. To ensure an environmental friendly and socially acceptable watershed planning under the project, following steps should be taken

2.1 Subproject Assessment and Analysis – E&S Screening

2.1.1 Selection criteria for the project activities.

The Himalayan watersheds are under constant threat of mass wasting and erosion caused by depletion of forest cover, unscientific agronomic practices, hydrologic imbalance and natural calamities. So the thrust has been given to implement such activities which not only minimize the negative environmental and social impacts but also enhancing the positive impacts. To ensure it, an Environmental and Social code of Practices has been developed and annexed in this guideline (Annexure-II). All the activities under the project should be in accordance to these codes of practices. The activities which causes negative impacts to the environment, can only be implemented after carrying out a limited Environmental Assessment (ESA) under project as listed in following Formats, 1(a) &1 (b)

Table 2.1 FORMAT 1 (a) –Criteria for exclusion of sub-projects/activity

Sl. No	Criteria
I	**Forests / biodiversity**
1	Activities likely to cause damage to wildlife by setting fire, injuring wildlife, or involving indiscriminate felling of trees or indiscriminate removal of plant, animal or mineral produce from sanctuaries/national park and adjoining forest area.
2	Activities likely to promote indiscriminate felling of trees.
II	**Dams**
3	Activity that involves construction of dam (existing or new) of 10 metres height or more
III	**Farming System**
4	Agricultural activities that intend to use banned pesticides, agrochemicals in the country & other than the slightly hazardous pesticides, agrochemicals listed in WHO class Ia, Ib and II **(refer Annexure- VI & VII)**
5	Activities that involve manufacture or sale, stocking or exhibiting for sale or distribution of any insecticide, pesticide, fertilizer, seed, medicine without a license
6	Activities that totally eliminate indigenous races of food crop
7	Activities that spread a Vector of diseases of livestock
8	Activities that use asbestos or asbestos containing materials
IV	**Land / Ecosystem**
9	Activities that causes pollution of water sources.
10	Activities that can cause risk of floods and damage to downstream resources
11	Activities which would require involuntary resettlement or forced acquisition of land
12	No constructions related to common activities to be taken up on land owned by vulnerable groups.
13	Activities which require land acquisition or causing physical relocation.
14	Activities which put permanent restrictions on access/ usage of resources.
15	Activity that have any adverse impact on the indigenous people/ vulnerable families in terms of displacement or their livelihoods being affected

Sl. No	Criteria
16	Activity that introduce/promote child labour.
17	Activity that exclude the vulnerable from the benefits.
18	Activity that involve production, storage and consumption of tobacco, drugs, alcohol, etc.
19	Activity that cause damage to cultural property, places of religious importance and restricted historical monuments.*

*Whenever there is a chance find of cultural or historical artefacts (moveable and immovable) the Department of Archaeology of the state Government, the Archaeological Survey of India will be informed. Should the continuation of work endanger the historical and cultural artefacts, the project work will be suspended until a solution is found for the preservation of these artefacts, or advice from the Archaeological Survey of India is obtained. It should be noted that Failure to report a chance find within the 48 hours of discovery, is a punishable offence under the relevant Indian legislation. Similarly, (intentional) damage to a historical or cultural artefact is a punishable offence.

Table 2.2 FORMAT 1 (b) Criterion for limited ESA of sub-projects/activity

Sl. No	Criteria
1	Construction of water impounding structures/ earth work with a height of more than 5 meter and less than 10 meter.
2	Construction of roads, bridge, civil works etc. that may cause destabilization of lands.
3	Activity that limit the traditional/legal rights of indigenous people on common property resources.
4	Activity that involve use of private land and causes loss of livelihood.

2.1.2 PROPOSAL OF MITIGATION MEASURES FOR POSSIBLE NEGATIVE IMPACTS OF THE ACTIVITIES

To effectively identify and address potential environmental and social risks within the project, a comprehensive set of mitigation measures and monitoring indicators has been developed. These are based on insights and lessons learned from previously implemented watershed projects by the Watershed Management Directorate (WMD), and form an integral part of the Environmental and Social Management Framework (ESMF).

The mitigation measures and indicators are designed to capture critical information related to the environmental and social dimensions of proposed Gram Panchayat Resilient Plans (GPRPs). During the planning phase, any potential adverse environmental or social impacts of proposed activities will be identified and discussed through Participatory Rural Appraisal (PRA) exercises.

If the Revenue Village Committee (RVC) or the Water and Watershed Management Committee (WWMC) proposes any activity under their Gram Panchayat (GP) plans, they must also incorporate suitable mitigation measures to address possible negative impacts. Drawing from past experiences, a list of commonly observed risks and corresponding mitigation strategies has been provided in Annex-1. This reference will guide WWMCs and project facilitators during PRA exercises and the preparation of GP plans, ensuring that all relevant safeguards are duly considered and integrated into the planning process.

During the initial screening stage, the facilitation team—comprising the Unit Officer, Social Coordinator, Social Facilitator, Agribusiness Managers, and the Multidisciplinary Team—will assess each proposed activity for potential risks. Once the GPRP is finalised, the responsibility for implementing mitigation measures will rest with the WWMCs, RVCs, User Groups (UGs), Farmer Interest Groups (FIGs), and Federations.

In addition, capacity-building sessions on the ESMF will be conducted for UCRRFP staff to enhance their understanding of its provisions. These trainings will equip facilitation teams to effectively screen activities and apply mitigation strategies throughout both the planning and implementation phases.

2.2 ENVIRONMENTAL AND SOCIAL ASSESSMENT (ESA)

The ESA would be used as a tool to evaluate the possible positive and negative impacts of the proposed watershed activities. To assess all the environmental and social impacts of activities, following Format-2 should be used at the planning phase. The possible environmental (A to S) and social (T to Z3) impacts listed in **Table-6**, should be discussed by RVC and WWMC and mentioned as positive or negative in the format. The code of proposed mitigation measures as per ESCPs in Annexure-VII should also be mentioned in the format. Several experience sharing exercises and Annexure VIII could be used for this purpose.

Table 2.3 CODES FOR POSSIBLE ENVIRONMENTAL AND SOCIAL IMPACTS OF PROJECT INTERVENTIONS

(To be filled in Format 2, as negative or positive for each project activity)

Codes	Environment Impacts
A	Impact on Surface Water (Quality/Quantity)
B	Possibilities of Siltation in water bodies (existing/constructed)
C	Soil Erosion/Gully Formation
D	Impact on stability of Hill Slopes/chances of Landslides
E	Impact on Soil Quality, Contamination
F	Soil Moisture regime , water bodies, water flows
G	Impact on Agricultural Productivity (Grain/Fodder)
H	Water/Air / Noise Pollution
I	Pressure on Surrounding Trees and Vegetation
J	Forest Fire
K	Impact on Biodiversity (Flora/Fauna), natural habitats
L	Impact on Aquatic Life
M	Invasion of Exotic Species
N	Impact on Rare, Threatened & Endangered Species
O	Impact on the existence of plant species of Medicinal Importance
P	Generation/accumulation of Solid Waste/ Wastewater
Q	Impact due to the use of Chemical Fertilizers/Pesticides
R	Impact (danger of extinction) to the Local Gene Pool (Plants/Crops)
	Social Impacts
S	Impact of the activity on Workload/drudgery (particularly on women)
T	Impact on availability of Nutritious Food
U	Dislocation/migration of People due to loss of traditional livelihood/ Local Labour
V	Impact on Benefits and Legal rights of vulnerable, SC/ST, transhumant and people belonging to other Marginalized Groups.
W	Use of Child Labour
X	Impact related to Insect, Pest and Wildlife Attacks
Y	Impact of the intervention on Places of Religious/Historical Importance/Monuments
Z	Social Conflicts (benefit sharing)
Z_1	Effect of the activity on Human Health
Z_2	Effect of the activity on Local Cultural/Ethical/Aesthetic Values

2.2 IMPLEMENTATION OF ESG

2.2.1 INSTITUTIONAL STRUCTURE

The responsibility for overall project implementation, coordination and monitoring will be with the Project Management Unit (PMU), established under the project, will be headed by the "Project Director". To support project implementation and its administration, there will be two regional coordination offices, headed by "Regional Project Directors"; one in Garhwal region and other one in Kumaon region. Under Regional Project Directors each project district will have "District Project Management Units (DPMU)", headed by the Deputy Director (Dy.Dir). Each DPMU will be well equipped with experts. The DPMUs will have officials from different disciplines, like engineering, agriculture, horticulture, animal husbandry, and forestry etc. Each DPMU will have 3, or 4 (Tehri and Nainital only) "Field Implementation Units/Unit office" to execute the project at the GP and watershed clusters. Unit office will have "Multi-Disciplinary Team", comprising officials from agriculture, horticulture, forestry etc., headed by the "Unit Officer".

PMU headed by the Project Director will have three Joint Directors, three Deputy Directors and a team of fourteen Experts in various sectors to support the field offices and staff for the implementation of project activities. Project Manager-Operation and Implementation along with GHG Emission Expert, Climate Change Expert, Climate Resilient Agri. Practices Expert and Social and Institutional Dev. Expert, will facilitate and monitor the implementation of ESMF in project areas. DPMU and Unit office will organize the capacity building and training of stake holders on ESMF, ensuring quality of project processes, providing adequate staffing and organizing timely monitoring & learning activities. The Dy.Dir(s), each with a number of MDTs will be the key facilitators and supervisors for the planning and implementation of GPRPs. The Dy.Dir(s) will be responsible for technical appraisal of the watershed plans prepared by the GPs in accordance with ESMF. The MDTs will provide project related information of the GPs and the communities facilitated planning within the Environmental and social framework of the project and provided technical guidance during implementation.

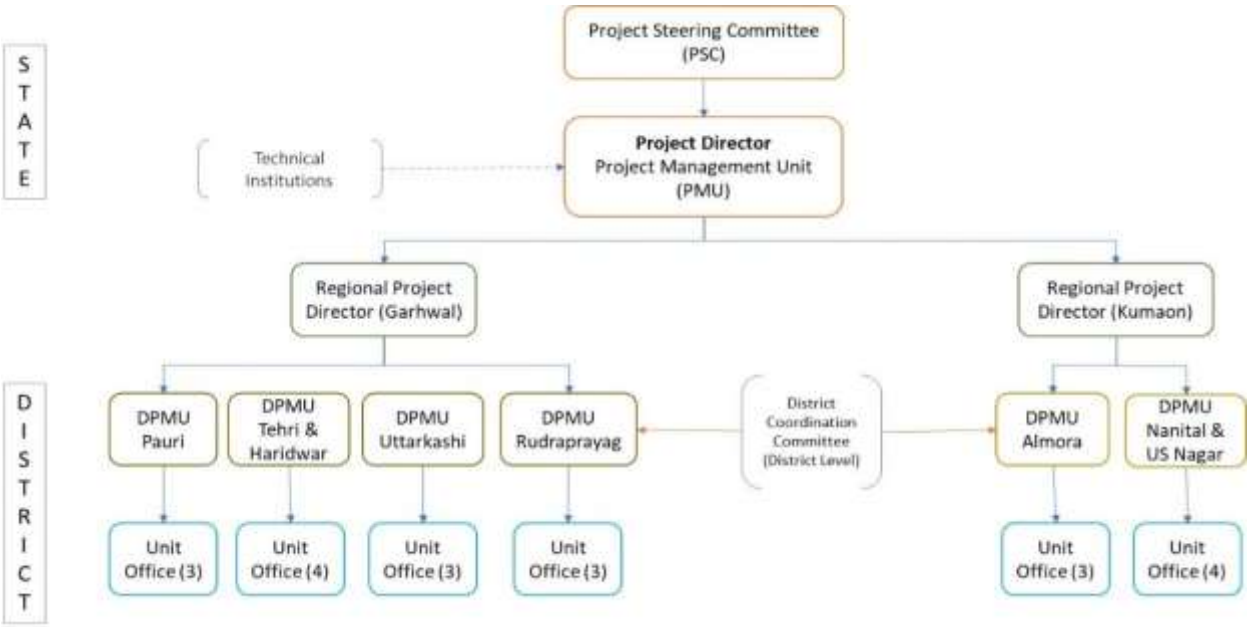


Fig 1- Institutional Structure

2.2.2 Procedures and Implementation Arrangements

The implementation of the Environmental and Social Management Framework (ESMF) in the Uttarakhand Climate Responsive Rainfed Farming Project (UCRRFP) follows a four-stage process that aligns with the planning and execution of Gram Panchayat Resilient Plans (GPRPs), Spring-shed Management Plans (SMPs), Climate Resilient Farming Plans (CRFPs), and LMP, IPPF including Transhumant Action Plan. This structured process ensures that all environmental and social safeguards are integrated at every step of the project cycle.

Stage 1: Sensitization and Capacity Building

This stage focuses on building awareness and understanding of ESMF principles among all stakeholders, including project staff, village-level institutions, and indigenous/transhumant communities.

1.a Imparting training to all village, district, state level project functionaries (PMU) at initiation of the project.

1.b Training to members of watershed committee-WWMC and key members of formal institution constituted under project with existing informal village level institutions (VLIs) and transhumant.

Role / Responsibility and Outcome of Stage 1

Institution	Responsibility	Outcome
PMU/WMD	To develop training module for ESMF, arrange training on the subject and develop information, education and communication (IEC) material.	Project teams and communities are well-informed about ESMF procedures and risks, setting the foundation for inclusive, risk-sensitive planning.
MDT/DPMU & Unit Staff	To sensitize the villagers and make them aware on environmental and social issues and provide information regarding ES safeguards.	
Village Level Institutions (WWMC of GP, RVC , VP, UG, Women Aam Sabha)	Participate actively in training, accept and incorporate ES principles into planning and implementation.	

Stage 2:- Screening and Planning

During PRA exercises, village-level activities will be planned. These activities will be screened (ESA) using pre defined criteria as per Annexure-1 (Criteria for exclusion of sub-projects/activity) to identify potential environmental and social risks.

2.a During PRA exercise undertaken by RVC, many proposals for activities to be undertaken in the village will be put forth. Each of these sub-projects/ activities will be screened using Table 2.1 (Format 1–a. Criteria for exclusion of sub-projects/activity) & Table 2.2 (Format 1-b. Criteria for limited ESA of sub-projects/activity). Any activity/ sub-project falls in 1 (b) then a limited ESA will be required to be carried out before being included in RVC Proposals and the action plan for transhumant.

2.b Subprojects / activities which are selected after screening using Format 1 (b) will be subjected to ESA as per Format 2 (Annex-I). This exercise (application of Format 2) will result in inclusion of mitigative measures to reduce or eliminate negative ES impacts of the subprojects/ activities. These sub project/activities will then be incorporated in GPRPs.

Annexure-II Environmental and Social Code of Practices (ESCPs) will be used as reference for mitigation measures that may be required for negative impacts. Annexure III provides comprehensive list of subprojects / activities and their possible negative impacts

Role / Responsibility and Outcome of Stage 2

Institution	Responsibility	Outcome
MDT	Facilitate PRA, support application of exclusion list and ESA formats, guide on safeguards and IPM, identify potential risks and include mitigation measures as applicable.	Environmentally and socially risky activities are identified early, and only compliant, inclusive activities are planned.
Social Facilitators	Support MDTs in identifying issues related to SC/ST, women, and other vulnerable groups.	
Executive committee of RVC/WWMC	Ensure activities comply with ESMF screening and are supported by appropriate mitigation plans.	

Stage 3:- Appraisal and Approval

In addition to GPRP, SMP, and CRFP, a separate proposal/plan for Marginalized Households will be prepared under the project. This plan will specifically focus on supporting **indigenous, vulnerable, and landless households**. Similarly, **transhumant communities** present in the project intervention areas will also be extended support through a **separate proposal/plan**. However, prior to providing any assistance, a **specific plan** will be developed for the transhumant groups ensuring that their unique needs are addressed. The draft plans will be **appraised at the DPMU level by the** Deputy Director (DD) before finalization by WWMC and approval by Gram Shabha.

DD will acknowledge that the ESMF guidelines has properly been followed in GPRP

3.a The financial approval to Draft GPRP of WWMC of GP and Marginalized/Transhumant Activity Plan will be granted after its review by DD to ensure that it conforms to provisions of ESMF. If the Draft of relevant plans is found to not-conform to ES guidelines the Plan will be referred back to WWMC/MDT with observations and suggestions for review.

3.b When the Draft proposal of each plans is referred back to WWMC of GP /MDT they will incorporate the required changes following steps 2 and 3 and resubmit the revised Plan to appropriate authority.

3.c The field appraisal these plans will be completed within period of 15 days of receipt by DPNU/Dy Dir. office.

Role / Responsibility and Outcome of Stage 3:

Institution	Responsibility	Outcome
Unit Officers	Conduct Field appraisal and ensure environmentally and socially risky activities are identified early, and only compliant, inclusive activities are planned.	After technical acknowledgement of DDs to safeguard-compliant draft village plans, the plans are approved by Gram-Sabha as 'GPRP' for implementation.
Deptuty Director (DPMU)	Make observations on different Plans regarding compliance to ESMF/ESG, Technical and Financial issues. Acknowledged the Marginalized/Transhumant Activity Plan/proposals after review.	
Gram Panchayat	Convene meeting of Gram Sabha to approve and adopt GPRP and Marginalized/Transhumant Activity Plan	

Stage 4 – Implementation, Monitoring, and Learning

This stage ensures effective execution, monitoring, and learning from safeguard practices.

4.a On receipt of appraised Draft GPRP the WWMC will convene a meeting of the Gram Sabha which will approve the Draft GPRP with modification/ suggestion if any and then this adopted Plan will be termed as Gram Panchayat Resilient Plan (GPRP).

4.b After the approval and adoption of GPRP, the WWMC will implement it. For monitoring purpose, last column of Annexure VIII will be referred.

4.c The GPRP will be implemented by the Gram Panchayat. The Gram Panchayat may associate RVC and any other institutions for implementation of activities as per the provision in Procurement Manual.

4.d The MDT will continuously assist the WWMC and other village level institutions in implementation of the GPRP.

4.e The major processes and impacts of activities to be monitored to ensure compliance of ESMF/ESG are listed in Annexure III (column 4).

4.f The WWMC may monitor itself or authorize the RVCs to monitor processes and impacts at village level. However the consolidated monitoring and learning (M & L) report will be furnished by WWMC to designated project authority.

4.g The observations of implementation modalities and the impact of activities on enhancing the productivity and income levels in the watershed treated by the GPRP as approved by the

provisions in Step III and IV, will be learned and the learning will be used to improve the provisions made in Step I and II.

Role / Responsibility and Outcome of Stage 4

Institution	Responsibility	Outcome
Gram Panchayat /WWMC/RVC/ Van Panchayat/User Group/Women Group	Implement activities in line with GPRP, SMP, CRFP and safeguard guidelines. Procurement, implementation, record keeping as per ESMF/ESG and other manuals of the Project. Ensure compliance as per the available ESMF documents LMP, SEP, and IPPF which outline labor management procedures, stakeholder engagement and information sharing, and the rights and inclusion of indigenous peoples.	Safeguards are monitored effectively, community learns from outcomes, and feedback is integrated to improve future planning and implementation.
MDT/Unit Office	Provide technical inputs/trainings for activities. Facilitate in record keeping. Ensure participation and capacity programs are in conformity with ESMF/ESG. Facilitate WWMC and other Village level institutions in participatory monitoring and learning (M & L).	
DPMU/DD	Ensure all reporting requirements from WWMC to Project are facilitated by them. Ensure Implementation, Internal Monitoring aligned with ESG and technical specifications laid down by the project. Ensure release of funds to WWMC as per the GPRP schedule.	
Participatory Monitoring and Evaluation Committee (PMEC)	Conduct annual Social Audit and ensure documentation and compliance with ESMF at village level.	
External Consultant (M & E)	Carry out independent evaluations and impact assessments through sample surveys.	
PMU (DDs, Subject Experts)	Consolidate M&L findings, ensure reporting, and document best practices across project areas.	

2.3 CAPACITY DEVELOPMENT FOR ENVIRONMENT AND SOCIAL MANAGEMENT

The project stakeholders will apply Environmental and Social safeguards mentioned in ESMF in all project activities during planning and implementation phases. Capacity building exercises including orientation, technical, refresher, advance trainings, workshops and exposure visits, focusing on ESMF safeguard implication and monitoring will be organized in accordance with capacity development strategy of the project. The capacity building exercises along with participatory monitoring and learning process would not only help to ensure the environmental and social safeguard application, but also develop awareness and understanding towards environmental solutions by the communities.

Capacity Building or project staff is vital in maintaining the sustainability of the project, emphasizing on knowledge development and skills building. The training programmes are to be coordinated and anchored by WMD. The contents will basically focus on the ESMF, regulatory requirements, environment and social priority issues in the project and clearly brings out the value addition and enhancement benefits of appropriate management of environmental and social issues.
Detailed trainings and workshops will be provided to field-based staff after inception of the project. The timings and type of the trainings based on skills required are given in Annexure IV- Figure 3. he multidisciplinary teams in the geographical divisions are provided training in the environmental and social management guidelines designed for the project.

Estimated budget allotment related ESMF:

Although the project does not have separate budget allocation heads for the formulation and implementation of the ESMF, SEP, and IPPF, a certain percentage of total budget will be spent under the heads of the Gram Panchayat Resilient Plan, Springshed Management Plan, and Capacity Development activities. The estimated allocation for the formulation and implementation of ESMF, SEP, and IPPF activities from the integrated budget under relevant heads is as follows:

Amount in INR

S.No.	Particulars	Total Budget	Budget proportion for ESMF SEP, and IPPF	Total assumed Budget for ESMF SEP, and IPPF
1	Environmental and social assessments (ESAs/ESMPs)	10000000	2%	200000
2	Training and capacity building for implementing agencies, contractors, and communities	180000000	2%	3600000
3	Grievance Redress Mechanism (GRM) implementation	500000	2%	10000
4	Monitoring and supervision, including field visits and third-party audits	134100000	2%	2682000
5	Awareness raising and stakeholder engagement	30000000	2%	600000
6	Consultant services (Social Consultant at PMU and other Social staff at DPMU & Unit Level)	132480000	2%	2649600
7	Contingency allocations for unforeseen E&S mitigation measures	0		0
	Total			**9741600**

2.4 MONITORING ARRANGEMENTS OF ESMF APPLICATION

ESMF safeguard application and monitoring in phase wise manner will be the responsibility of all project stakeholders. A continuous process of consultations between all stakeholders for the execution of interventions is required to find out whether the planned interventions are being executed as per the ESMF or not. If not, corrective actions need to be taken in order to realize the expected environmental and social impact. The ESMF application monitoring will also help communities as well as project team to understand the visible/possible impacts of the interventions/mitigation measures/local environmental solutions taken in accordance with ESMF. Following monitoring arrangements will be made to ensure the ESMF application. There will be key monitoring indicators which will be tracked through the MIS as well as M&E reports (internal and external). The indicators include:

- Percent of GPRPs Screened
- Percentage of project staff trained on ESMF
- Percentage of community (beneficiaries) trained on ESMF, including female, Tribal and Transhumant population
- Percentage of GPRPS in compliance with legal and regulatory framework, percentage of compliances
- Percentage of applicable mitigations measures being implemented on ground
- Number of good practices/eco-friendly activities integrated into GPRPs, sector wise (agriculture, livestock, IGAs etc.)

2.4.1 Planning Phase

The approval to Draft Plans of GP and action plan for transhumant will be granted after its proper review by MDT members, DDs to ensure that it conforms to provisions of ESA. If the Draft plan is found to not-conform to ESMF guidelines the Plan will be referred back to GP with observations and suggestions for review.

2.4.2- Village level monitoring

Monitoring of ESMF safeguard application at village level will done by the constituted WWMC (a GP level committee) by itself or will be authorize the revenue village level committee to monitor the safeguard application processes and impacts at village level. At the village level the participatory monitoring will also done by PME team.

2.4.3- Internal project monitoring

To provide a clearer understanding of institutional roles and responsibilities beyond the stage-wise process, a compiled table has been prepared along with the below summarizing the key responsibilities of various stakeholders involved in the implementation, internal monitoring of the ESMF.

S.No.	Level	Key Responsibilities
1	Project Management Unit (PMU)	• Overall coordination and implementation. • Designates Environmental & Social Specialists. • Develops training modules and IEC materials and conducts trainings at state level for district teams • Consolidates monitoring data and reporting.
2	District Project Management Unit (DPMU)- Headed by Deputy Directors	• Review and appraise GPRP, SMP, CRFP and Marginalized/Transhumant Activity Plans. • Supervise compliance with ESMF provisions.

		• Support capacity building for FIUs and MDTs and internal monitoring.
3	Field Implementation Unit (FIU) / Unit Officers	• Verify field-level implementation as per ESMF. • Provide handholding support to WWMCs, RVCs to ensure all selected activities are compliant with ESMF and prioritize community needs while avoiding any activity listed under the Exclusion List. • Ensure Implementation of LMP, IPPF guidelines. • Facilitate the Grievance Redressal process. • Participate in community capacity building.
4	Multidisciplinary Teams (MDTs) and other officials-(Social Facilitators, Agribusiness managers, J.E and different subject matter persons)	• Facilitate PRA and participatory planning to select activities are compliant with ESMF. • Screening sub-projects for environmental and social risks. • Integrate mitigation measures into GPRPs, SMPs, and CRFPs • Provide handholding support to WWMCs, RVCs to implement compliances align with LMP, IPPF. • Provide handholding support to WWMCs, RVCs to ensure grievance mechanism implementation. • Conduct field-level training and awareness sessions.
5	WWMC / RVC (Village Level)-	• Implement GPRP, SMP, and CRFP. • Monitor safeguard compliance like LMP, Grievance Redressal and IPPF Plan. • Participate in planning and community-based monitoring.
6	Participatory Monitoring and Evaluation Committee (PMEC)-(Gram Panchayat Level)	• Conduct annual Social Audit including No. of grievance resolved or pending. • Ensure documentation of ESMF compliance. • Report deviations and suggest corrective actions.
7	External Monitoring and Evaluation Agency-Independent Consultants.	• Mid-term and end-line evaluations of ESMF implementation using approved tools and methodologies.

2.4.4- External Monitoring

ESMF safeguard application will be also monitored by external consultant on sample basis using prepared questionnaire and assessment modules which will be approved by the Watershed Management Directorate. The third party monitoring will be conducted at Mid-Term Evaluation and Final Assessment by an external agency in close collaboration with the Project Directorate.

2.5 INCIDENT REPORTING PROTOCOL

The Watershed Management Directorate (WMD), through its Project Management Unit (PMU) and District Project Management Units (DPMUs), is responsible for promptly reporting any environmental, social, health, or safety (ESHS) incidents that occur during the implementation of the Uttarakhand Climate Responsive Rainfed Farming Project (UCRRFP).

Step 1: Immediate Notification

Any Occupational Health and Safety (OHS) incident or other significant ESHS event (e.g., injury, fatality, environmental spill, community conflict, SEA/SH allegation) must be reported to the PMU as soon as it becomes known. The PMU will notify the World Bank within 48 hours of learning about the incident. The initial notification should include:

- Date and location of the incident
- Nature and severity of the incident
- Immediate actions taken
- Whether the incident is ongoing or contained

Step 2: Detailed Incident Report

A comprehensive incident report must be submitted within a timeframe agreed with the World Bank. This report should include:

- A detailed description of the incident
- Root Cause Analysis (RCA)
- Identification of contributing factors
- Stakeholders involved or affected
- Immediate and long-term corrective actions
- Timeline for implementation of corrective measures

Step 3: Corrective Action Plan and Monitoring

The PMU, in coordination with the relevant DPMU and technical supervision consultants, will prepare a Corrective Action Plan (CAP) to address the root causes and prevent recurrence. The CAP will be reviewed and agreed upon with the World Bank. Implementation of the CAP will be closely monitored by the PMU's Environmental and Social Specialists, with support from field-level staff and supervision consultants.

Step 4: Documentation and Closure

All incident reports, CAPs, and follow-up actions will be documented and archived in the project's ESHS management system. Once corrective actions are completed and verified, the incident will be formally closed. The PMU will include summaries of incidents and responses in its quarterly progress reports to the World Bank.

Chapter-3

Sector Specific Safeguard Strategies

Agriculture:

Agriculture, through introduction of HYV and off-season vegetables cultivation is seen as a key intervention of the project that has direct impact on the economic status of project beneficiaries. Through ESMF guidelines the objective is to minimize or mitigate the negative environmental and social impacts and to enhance the positive impacts. Also on the other hand, to assure that impacts of the interventions made for watershed development will environment-friendly, socially acceptable and economically feasible to make them long lasting. The strategies described below will be used to facilitate the safer use of chemicals is optimized where inevitable.

3.1 Integrated Crop Management

Integrated crop management is a holistic approach for overall management of cropping systems from seed to seed for obtaining potential yield under FIS. Integrated crop management comprises four important components. They are:

- Integrated plant nutrient management (IPNM)
- Integrated weed management (IWM)
- Integrated pest & disease management (IPDM)

IPNM is dependent on IWM, IPDM is dependent on IPNM. Likewise all the three components are interdependent and supplementary to each other. IPDM without IPNM and IWM will not produce potential yield. Hence, all our trainings, field trials and demonstrations will combine IPNM, INM, IPDM and IWM judiciously aiming at farming system intensification. Farmers' Field School will be the best way to disseminate the strategic approaches and techniques of ICM (Annexure-V) to the farmers of the project area in a comprehensive manner.

3.2- Integrated Pest Management (IPM)

Pest management is an ecological matter and has much relevance in the context of highly fragile ecosystem in the Uttarakhand hills. Over-reliance on the use of synthetic pesticides in crop protection programs has resulted in disturbances to the environment, pest resurgence, pest resistance to pesticides, and lethal and sub-lethal effects on non-target organisms, including human's world over. These side effects have raised public concern about the routine use and safety of pesticides. Therefore the farmers are required to manage their land with greater attention to direct and indirect off-farm impacts of various farming practices on water, soil, and wildlife resources. Thus, reducing dependence on chemical pesticides in favour of ecosystem manipulations is a better strategy for farmers of the region. Successful IPM is based on sound farmer's knowledge of the on-going agro-ecological processes of the farming environment; such farmers should therefore be technically sound to make decisions on the most appropriate management strategies to apply at the specific period of crop development.

To manage serious outbreaks of insect pests, farmers should be given First and Prime priority to biological/Cultural method of IPM over Mechanical control method. Subsequently the use of Chemical methods will be only last and ultimate priority and only, if crop loss is beyond Economic Threshold Level (ETL).

3.2.1 Objective & Aim of the Pest Management Plan

The purpose of this document is to describe a Plan by which the project will endeavor to promote and support safe, effective, and environmentally sound pest management in agricultural interventions undertaken under previous project. The plan further presents components to strengthen such capacity.

The Plan promotes the use of biological and environmental control methods and the reduction in reliance on synthetic chemical pesticides. The Plan addresses pest management issues in the context of the project's environmental assessment. (Details - Annexure- V).

3.2.2 The World Bank Operational Guidelines

The World Bank & IFC Pesticide guidelines aims to ensure that the pesticide

- Must have negligible adverse human health effects
- Should be effective against target pests and minimal effect on non target species
- Development of pest resistance to be kept in view
- Public health pesticides must be safe for inhabitants and animals

Integrated pesticide management specifically identifies the following as the key in pest control.

- A categorical preference for bio control methods along with institutional and capacity building for the same.
- Reducing reliance on synthetic chemical pesticides and only if approved by IPM approach.
- Does not permit under any circumstance the use IA, IB and II classified pesticides. Listing of these chemicals and provided by the World Health Organization is given at the end of the report.
- Recommends the use of Participatory IPM along with specific investment components for the same.
- The permissible pesticides under project (WHO's category-III and U)8 are listed in Annexure-V. But even these must be used as part of the IPM strategy while adhering to Codes of Practices/Safety pocedures

8 https://iris.who.int/bitstream/handle/10665/332193/9789240005662-eng.pdf?sequence=1

Table 3.1 Integrated Pest Management (IPM) practices for major crops in Uttarakhand

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
Cereal Crop				
Paddy	Yellow Stem Borer (YSB)	Clip seedling tips, use short-duration varieties, community tillage.	Collect and destroy egg masses, clipping of seedling tips.	Release Trichogramma japonicum @ 1 lakh/ha, conserve spiders and beetles.
	Leaf Folder	Avoid excess nitrogen, wider spacing (22.5x20 cm).	Coir rope dislodging, clipping of leaves.	Release Trichogramma chilonis @ 1 lakh/ha, conserve spiders, Stenobracon parasitoids.
	Gall Midge	Early sowing, avoid staggered planting, control grassy weeds.	Field drainage (5-7 days).	Conserve wasps and spiders.
	Brown Plant Hopper (BPH), WBPH	Avoid high nitrogen, proper spacing, synchronized planting.	Manual collection if heavy infestation.	Conserve spiders and beetles.
	Rice Hispa	Clip and destroy infested leaves, remove volunteer rice.	Sweep nets, leaf clipping.	Conserve Bracon sp., spiders, ladybird beetles.
	Caseworm	Early planting, wider spacing (30x20 cm).	Field drainage, coir rope dislodging.	Release Trichogramma chilonis @ 1,50,000/ha.
	Whorl Maggot	Water drainage intervals, Azolla/Savinia cover.	Manual removal of larvae.	Conserve spiders and beetles.
	Swarming Caterpillar, Cutworm	Deep ploughing, early sowing.	Coir rope dislodging, manual collection.	Conserve birds and ground beetles.
	Rice Leafhoppers/GLH	Timely planting, avoid excess nitrogen, intercropping.	Manual control.	Conserve Anagrus, Oligosita parasitoids.
	Gundhi Bug	Early maturing varieties, intercropping with soybean.	Manual collection.	Conserve spiders.
Wheat	Termite	Deep ploughing in summer, crop rotation, well-rotted FYM.	Dismantle termitaria and kill termite queen.	Neem cake @ 80 kg/acre, EPNs @ 100 million/acre.

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
	Wheat Aphid	Grow barrier crops (maize, sorghum).	Regular field monitoring.	Conserve ladybird beetles, parasitoids.
	Armyworm / Cutworm	Deep ploughing, crop rotation, intercropping (cowpea, onion, maize).	Pheromone traps @ 4-5/acre, bird perches @ 10/acre.	Release Trichogramma spp., conserve predators.
	American Pod Borer	Grow intercrops, barrier crops like sorghum.	Pheromone traps @ 4-5/acre.	Release Trichogramma pretiosum @ 0.4 lakh/acre, conserve natural enemies.
	Pink Stem Borer	Grow resistant varieties, timely sowing.	Light traps @ 1/acre.	Conserve parasitoids and predators.
	Shoot Fly	Plant barrier crops, timely sowing.	Fish meal traps @ 2-3/ acre.	Natural enemies, birds like black drongo.
	Brown Mite	Use tolerant varieties, avoid excess nitrogen.	-	Neem oil (2%), NSKE (5%).
	Ghujhia Weevil, Wheat Thrips	Field sanitation, crop rotation.	Light traps @ 1/acre, sticky traps @ 5/ acre.	Conserve predators and parasitoids.
	Wheat Bug	Grow resistant varieties, timely sowing.	Manual collection.	Natural enemies.
Maize	Maize Stem Borer	Deep ploughing, intercropping, resistant varieties (HQPM 1, DHM 117, HM4).	Removal of dead hearts, bird scarer.	Release Trichogramma chilonis @ 1 lakh/ha, conserve Cotesia flavipes, spiders, beetles.
	Pink Stem Borer	Same as Maize Stem Borer.	Light traps @1/ acre.	Conserve parasitoids and predators.
	Shoot Fly	Timely sowing, intercropping with legumes.	Fish meal traps*, bird scarer.	Release Trichogramma chilonis@ 0.5 lakh/ha, conserve natural enemies.
	White Grub	Deep ploughing, crop rotation, decomposed FYM.	Manual destruction of adults.	Neem cake @ 80 kg/acre, conserve Tiphia parasitoids.
	Cutworm	Deep ploughing, crop rotation.	Light and pheromone traps @ 4-5/acre..	Conserve natural enemies.
	Hairy Caterpillar	Crop rotation, timely sowing.	Collection of egg masses, larvae.	Conserve parasitoids and predators.

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
	Aphid	Use tolerant varieties, avoid excess nitrogen.	Monitoring, manual removal.	Conserve Aphidius spp., ladybird beetles, syrphids.
	Armyworm	Intercropping, crop rotation.	Light traps @ 1/acre.	Release Trichogramma @ 1lakh/ha, conserve predators.
	Pyrilla	Timely sowing, weed removal.	Monitoring, manual removal.	Conserve Epiricania melanoleuca, lacewings.
	Thrips	Intercropping, barrier crops.	Sticky traps@ 5/ acre, manual collection.	Conserve predatory mites, natural enemies.
	Termite	Decomposed FYM, crop rotation.	Destroy termitaria.	Neem cake @ 80 kg/acre, biocontrol agents.
	Chafer Beetle	Timely sowing, crop rotation.	Manual collection.	Neem cake @ 80 kg/acre, conserve predators.
Vegetable Crop				
Onion	**Thrips**	Crop rotation, proper spacing, avoid continuous cropping.	Blue sticky trap*s, reflective mulch.	Conserve predatory thrips, Chrysoperla spp., ladybird beetles.
	Onion Maggot (Delia spp.)	Crop rotation, remove crop residues.	Collection and destruction of infested plants.	Conserve parasitoids, use Beauveria bassiana.
	Cutworm	Deep ploughing, weed control.	Hand-pick larvae, Light traps @ 1/acre.	Natural predators like birds, ground beetles.
	Mite	Use healthy bulbs, maintain field hygiene.	Manual removal of infested plants.	Neem oil spray 2%, predatory mites.
Potato	**Aphid**	Avoid excess nitrogen, plant tolerant varieties.	Yellow sticky traps@ 5/ acre, water spray to remove aphids.	Conserve ladybird beetles, Chrysoperla spp., parasitoids (Aphidius spp.).
	Cutworm	Deep ploughing, proper field sanitation.	Hand-pick larvae, Light traps @ 1/acre.	Conserve natural predators like birds, ground beetles.

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
Tomato	**Fruit Borer (Helicoverpa armigera)**	Crop rotation, early sowing, resistant varieties.	Hand-picking of larvae, pheromone traps @ 4-5/acre..	Release Trichogramma chilonis@ 1 lakh/ha, conserve predators (spiders, ladybird beetles).
Brinjal	**Shoot and Fruit Borer**	Resistant varieties, crop rotation, remove alternate hosts.	Removal and destruction of infested shoots and fruits.	Release Trichogramma chilonis @ 1lakh/ha, conserve spiders, parasitoids.
Cruciferous	**Diamondback Moth (DBM)**	Intercropping with tomato/mustard, remove crop residues.	Handpick larvae use Light traps @ 1/acre.	Release Trichogramma chilonis @ 50,000/ha, conserve Cotesia plutellae, ladybird beetles.
Cucurbitaceous	**Fruit Fly (Bactrocera spp.)**	Field sanitation, timely harvesting, crop rotation.	Use bait traps* with attractants.	Release Trichogramma spp., use Metarhizium anisopliae fungus.
Leguminous	**Pod Borer (Helicoverpa armigera)**	Early sowing, crop rotation, resistant varieties.	Hand-pick and destroy larvae.	Release Trichogramma chilonis @ 60,000/ha, conserve natural enemies (spiders, birds).
Fruit				
Aonla	**Shoot Gall Maker**	Prune affected shoots, maintain orchard hygiene.	Hand removal of affected shoots.	Conservation of parasitoids like Eretmocerus sp., Closterocerus sp.
	Bark Eating Caterpillar	Keep trees healthy and vigorous.	Remove webbing and caterpillars manually.	Use of biocontrol agents like Chrysoperla spp., predatory ants.
	Fruit Sucking Moth	Remove weeds and alternate host plants nearby.	Use Light traps @ 1/acre and handpick adults at night.	Conservation of natural enemies like spiders, Dicyphus hesperus.
	Whitefly	Avoid overcrowding, ensure good air circulation.	Yellow sticky traps@ 5/ acre, pruning infested branches.	Release Encarsia formosa, Eretmocerus spp.
	Mealybug	Manage ant population, maintain orchard sanitation.	Scrape off colonies, prune infested parts.	Release predators like Cryptolaemus montrouzieri, Chrysoperla spp.
Apple	**San Jose Scale**	Prune and destroy infested branches, maintain tree health.	Scrub and remove scale colonies manually.	Release Aphytis spp., Encarsia spp.

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
	Woolly Apple Aphid	Remove root suckers and water sprouts.	Hand removal of colonies.	Release Aphelinus mali parasitoids.
	Codling Moth	Timely harvesting, remove fallen fruits.	Pheromone traps @ 4-5/acre. for monitoring and mass trapping.	Use Trichogramma spp., conservation of natural enemies.
	Fruit Borer	Field sanitation, remove alternate hosts.	Collect and destroy infested fruits.	Encourage parasitoids and predators.
	Leaf Roller	Clean cultivation, prune infested twigs.	Handpick and destroy larvae.	Use Trichogramma spp., Chrysoperla spp. predators.
Apricot	**Fruit Fly (Bactrocera spp.)**	Timely harvesting, field sanitation.	Use methyl eugenol bait traps.	Release Trichogramma spp., use of Metarhizium.
	Aphid	Avoid excess nitrogen, remove weeds.	Yellow sticky traps@ 5/ acre, water spray@ 2/ acre.	Conserve ladybird beetles, Chrysoperla spp.
	Shot Hole Borer	Maintain tree vigor, avoid mechanical injuries.	Removal and destruction of infested branches.	Encourage natural enemies like predatory beetles.
	Mealybug	Maintain orchard sanitation, manage ant populations.	Prune and destroy affected plant parts.	Release Cryptolaemus montrouzieri, predatory ants.
Ber	**Fruit Fly (Bactrocera spp.)**	Field sanitation, timely harvesting.	Use bait traps* with attractants (methyl eugenol).	Use Beauveria bassiana, Metarhizium.
	Mealybug	Manage ants, maintain clean orchards.	Scrape off colonies, prune infested branches.	Release Cryptolaemus montrouzieri, Chrysoperla spp. predators.
	Leaf Webber	Timely pruning, field sanitation.	Collect and destroy larvae and webs.	Conserve parasitoids and spiders.
	Fruit Borer	Regular pruning, remove alternate hosts.	Destroy infested fruits.	Release Trichogramma spp., conserve natural predators.

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
Citrus	Citrus Psylla	Proper pruning to remove dense canopy.	Collect and destroy infested leaves.	Release Tamarixia radiata parasitoids.
	Leaf Miner	Avoid overlapping new flushes.	Prune affected shoots.	Conserve Chrysoperla spp., Pediobius spp. parasitoids.
	Black Fly	Maintain orchard hygiene, avoid water stress.	Yellow sticky traps@ 5-7/acre, prune heavily infested parts.	Encourage natural predators like Chrysoperla spp., ladybird beetles.
	Fruit Sucking Moth	Field sanitation, weed removal.	Light traps @ 1/acre, hand collection of moths.	Conserve spiders, predatory bugs.
	Mealybug	Manage ants, maintain clean orchard.	Prune and destroy infested parts.	Release Cryptolaemus montrouzieri, conserve natural enemies.
Guava	Fruit Fly	Field sanitation, early harvesting.	Use methyl eugenol traps.	Release parasitoids like Fopius arisanus, use of biopesticides.
	Mealybug	Clean orchards, control ants.	Manual removal of colonies.	Release Cryptolaemus montrouzieri, Chrysoperla spp.
Litchi	Fruit Borer	Prune infested twigs, clean cultivation.	Collect and destroy infested fruits.	Release Trichogramma spp., conserve natural enemies.
	Leaf Folder	Proper pruning and sanitation.	Handpick and destroy larvae.	Encourage parasitoids and predators.
Mango	Fruit Fly	Collect fallen fruits, clean cultivation.	Use methyl eugenol traps*.	Release parasitoids like Fopius arisanus.
	Hopper	Avoid dense planting.	Prune affected parts.	Conserve spiders, Chrysoperla spp.
Papaya	Mealybug	Clean field, manage ant population.	Scrape colonies.	Release Cryptolaemus montrouzieri.
	Fruit Fly	Timely harvesting.	Use traps and destroy infested fruits.	Use parasitoids like Diachasmimorpha longicaudata.
Peach	Fruit Moth	Remove alternate hosts.	Collect and destroy affected fruits.	Release Trichogramma spp.

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
	Aphid	Proper pruning.	Water spray*.	Conserve ladybird beetles, Aphidius spp.
Pear	**Psylla**	Proper pruning.	Remove infested shoots.	Conserve Tamarixia spp.
	Codling Moth	Remove fallen fruits.	Use pheromone traps@4-5/ acre .	Trichogramma spp., natural enemies.
Pomegranate	**Fruit Borer**	Sanitation, pruning.	Destroy infested fruits.	Release Trichogramma spp.
	Aphid	Avoid excess nitrogen.	Water spray.	Conserve ladybird beetles.
Raspberry	**Fruit Worm**	Crop rotation.	Collect and destroy larvae.	Encourage natural enemies.
	Aphid	Remove weeds.	Sticky traps@ 2-3/acre.	Conserve predators.
Strawberry	**Aphid**	Avoid overcrowding.	Yellow sticky traps@ 2-3/acre.	Conserve predators.
	Spider Mite	Maintain moisture.	Remove affected leaves.	Use predatory mites.
Walnut	**Codling Moth**	Collect and destroy fallen fruits.	Use pheromone traps @ 4-5/acre..	Release Trichogramma spp.
	Aphid	Avoid excess fertilizers.	Water spray.	Conserve ladybird beetles.
Spices				
Turmeric	**Shoot borer**	Plant ecological engineering plants, destroy infested shoots, mulching	Light traps @ 1/acre, collect and kill moths	Release Trichogramma chilonis @ 40,000/acre, conserve natural enemies, spray neem oil (0.5%)
	Rhizome scale	Collect and destroy severely infested rhizomes, select healthy rhizomes		
	Thrips			Conserve natural enemies like Ceranisus menes, Syrphid fly, minute pirate bug
	Bihar hairy caterpillar	Collect and destroy egg masses and larvae, remove alternate weed hosts		Conserve natural enemies like Bracon spp., release Trichogramma spp.

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
	Lacewing bug	Destroy volunteer plants and old neglected plantations, use healthy rhizomes		
	Leaf roller/skipper	-		Conserve natural enemies like Apanteles sp, Sympiesis sp, Brachymeria coxodentata
	White grubs	Uproot infested plants, use well decomposed FYM		
	Root-knot nematode	Uproot and destroy infested plants, treat rhizomes with hot water, crop rotation		Apply neem seed cake, Pochonia chlamydosporia
	Rhizome rot	Use resistant varieties, crop rotation, proper drainage, phytosanitary measures		Apply pine needle and neem cake powder, use fermented plant extract (FPE)
	Leaf spot	Pluck and remove infested leaves, use proper green mulching		Use plant extracts like garlic extracts
	Leaf blotch	Use proper green mulching		Use plant extracts like garlic extracts
	Dry rot	Field sanitation, crop rotation		-
	Bacterial wilt	Soil solarization, planting disease-free seed rhizomes, crop rotation		-
Chillies/ Capsicum	**Thrips**	Intercrop with Sesbania grandiflora, avoid chilli and onion mixed crop, sprinkle water over seedlings	Use yellow/blue pan water sticky traps@ 2-3/acre, handpick infested parts	Apply neem cake @ 100 Kg/acre, seed treatment with imidacloprid 70% WS
	Aphids	Maintain field sanitation, remove weeds	Use yellow/blue pan water sticky traps@ 2-3/acre, handpick infested parts	Conserve ladybird beetles, Chrysoperla spp..

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
	Red Spider Mite	Maintain field sanitation, avoid water stress	Use yellow/blue pan water sticky traps @ 2-3/acre, handpick infested parts	Spray neem oil 2%, conserve predatory mites (Amblyseius spp.).
	Tobacco Caterpillar	Maintain field sanitation, avoid water stress	Use light trap @ 1/acre, handpick larvae	Use Nuclear Polyhedrosis Virus (NPV) and Bacillus thuringiensis.
	Gram Pod Borer	Use ovipositional trap crops like marigold, maintain field sanitation	Use light trap @ 1/acre, handpick larvae	Release Trichogramma chilonis*** @ 1,50,000/ha, conserve predators (spiders, beetles).
	Whitefly	Maintain field sanitation, remove weeds	Use yellow/blue pan water sticky traps@ 2-3/acre, handpick infested parts	Release Encarsia formosa, Chrysoperla spp.
	Choanephora Blight	Adopt recommended spacing, maintain field sanitation	Remove infected plant parts	Use bioagents like Trichoderma viride***, neem oil spray (2%).
	Die Back and Fruit Rot	Maintain field sanitation, avoid water stagnation	Remove infected plant parts	Apply Trichoderma harzianum***, neem oil spray.
	Mosaic Complex	Maintain field sanitation, remove weeds	Remove infected plant parts	Encourage natural enemies, apply neem oil (2%).
	Powdery Mildew	Maintain field sanitation, avoid water stress	Remove infected plant parts	Use Trichoderma harzianum***, apply sulphur dust.
	Cercospora Leaf Spot	Maintain field sanitation, remove weeds	Remove infected plant parts	Use Trichoderma viride*** and neem oil spray.
	Bacterial Leaf Spot	Maintain field sanitation, remove weeds	Remove infected plant parts	Use bioagents like Pseudomonas fluorescens***.
	Alternaria Leaf Spot	Maintain field sanitation, avoid water stress	Remove infected plant parts	Apply Trichoderma viride*** and neem oil spray (2%).
	Fusarium Wilt	Maintain field sanitation, avoid water stress, Use resistant varieties, proper spacing.	Remove infected plant parts	Apply neem cake @ 100 Kg/acre, apply carbofuran 3% CG

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
Ginger	**Shoot borer**	Use attractant plants for natural biocontrol conservation, mulching with green leaves	Cut open the shoot and pick out the caterpillar	Conserve natural bioagents like ladybird beetle, spiders, Chrysopids, Trichogrammatids, Bracon sp, etc.
	Rhizome scale	Apply well-rotted sheep manure or poultry manure in splits	Collect and destroy damaged leaves	-
	Leaf roller/Skipper	Intercropping with paddy or other crops	Collect and destroy larvae and egg masses	Conserve natural bioagents like ladybird beetle, spiders, Chrysopids, Trichogrammatids, Bracon sp, etc.
	Thrips	-	-	Conserve natural enemies like Syrphid fly, minute pirate bug, predatory thrips, etc.
	White grubs	Use well-decomposed FYM, install Light traps @ 1/acre after first monsoon showers	Uproot infested plants, collect and destroy larvae	EPN Steinernema sp. can be mixed in the FYM and applied in the field
	Rhizome fly	Destroy stray plants in the off-season, select and plant healthy rhizomes	Remove and destroy rotting rhizomes	Conserve natural bioagents like ladybird beetle, spiders, Chrysopids, Trichogrammatids, etc.
	Root-knot nematode	Intercropping with marigold, deep ploughing or solarized beds during summer	Uproot and destroy infested plants	Application of neem seed cake, use of marigold plantation, Gliricidia compost
	Soft rot	Ensure proper drainage, use resistant varieties, crop rotation with maize, cotton, soybean	Uproot and destroy infected plants	Application of pine needle or neem cake powder treatments, use of bio-fumigation
	Bacterial wilt	Soil solarization, crop rotation with non-host crops	-	Incorporation of Pseudomonas spp., AM fungi, and other BCAs
	Leaf spot	Use proper green mulching to reduce soil splashes, provide shade	Pluck and remove infected leaves	-
	Fusarium yellows	Use raised beds, practice biodisinfestation procedures	-	Application of pine needle and neem cake powder treatments

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
	Leaf eating caterpillar	Collect and destroy infested leaves along with larvae in June-July and Oct-Dec.	Community approach of mechanical control may be adopted in the locality.	-
	Banana aphid	Remove and destroy diseased plants. Destroy wild Amomum, Colocasia, Curcuma.	-	-
	Shoot fly	Regularly monitor new plantations. Remove infested young shoots at ground level.	-	-
	Stem borer	Remove and destroy infested shoots based on 'dead heart' symptoms.	-	-
	Rhizome weevil	-	-	-
	Leaf thrips	Collect and destroy infested leaves.	-	-
	White grub	Mechanical collection of adult beetles during the emergence period.	-	Entomopathogenic nematodes (EPNs) can be sprayed at the rate of 100 million/acre.
	Chirkey & foorkey disease	Regular survey of the plantation. Remove and destroy diseased plants.	-	-
	Wilt disease/seedling rot	Avoid planting in swampy or dry areas. Collect and destroy affected plants.	-	-
	Flower rot	Avoid accumulation of leaf mass over inflorescence during rainy season.	Collect and bury affected flowers/spike.	-
Garlic	**Onion thrips**	Use resistant/tolerant varieties, field sanitation, avoid successive	-	Conserve parasitoids (Ceranisus menes), predators (syrphid flies,

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
		planting of preferred/alternate host crops, plant new crop upwind, reflective mulches, sprinkler irrigation, barrier crops		minute pirate bug, praying mantis, predatory thrips, damselbug, lacewings, coccinellids, spiders)
	Onion maggot	Avoid close spacing, crop rotation, field sanitation	-	Conserve predators (ground beetle, rove beetles, spiders)
	Bulb mite	Avoid planting garlic after cole crops, avoid successive onion or garlic crops, flood irrigation, sow clean seed cloves	-	Conserve predators (anthocorid bugs, mirid bugs, syrphid/hover flies, green lacewings, predatory mites, predatory coccinellids, staphylinid beetle, predatory cecidomyiid fly, predatory gall midge, spiders)
	Eriophyid mite	Flood irrigation, avoid planting successive onion or garlic crops	-	Conserve predators (anthocorid bugs, mirid bugs, syrphid/hover flies, green lacewings, predatory mites, predatory coccinellids, staphylinid beetle, predatory cecidomyiid fly, predatory gall midge, spiders)
	Red spider mite	Thorough water spray	-	Conserve and augment natural enemies (anthocorid bugs, mirid bugs, syrphid/hover flies, green lacewings, predatory mites, predatory coccinellids, staphylinid beetle, predatory cecidomyiid fly, predatory gall midge, spiders)
	Gram pod borer and Tobacco caterpillar	Field sanitation, ecological engineering with intercrops, crop rotation, repellant plants, bird perches, pheromone traps, light traps	-	Inundative release of Trichogramma spp., conserve parasitoids (Tetrastichus spp., Telenomus spp., Campoletis chlorideae), conserve predators (Chrysoperla zastrowi

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
				sillemi, coccinellids, King crow, common mynah, wasp, dragonfly, spider, robber fly, reduviid bug, praying mantis, fire ants, big eyed bugs, pentatomid bug, earwigs, ground beetles, rove beetles), apply entomopathogenic nematodes (EPNs)
	Damping off	Soil solarization, avoid excessive watering, use raised beds, crop rotation, proper drainage, sow clean and healthy seed on raised beds, avoid overcrowding, use well decomposed farmyard manure	-	-
	Purple blotch	Use healthy seeds, crop rotation, proper drainage, recommended doses of N and P fertilizers, hot water soaking of garlic seed, use resistant varieties	-	-
	Stemphylium leaf blight	Field sanitation, long rotations with non-host crops, proper field drainage, reduce plant density, hot water soaking of garlic seed	-	-
	Colletotrichum blight/anthracnose/twister disease	Field sanitation, destruction of infected plant debris, use resistant varieties	-	-
	Downy mildew	Select healthy bulbs for seed production, crop rotation, crop sanitation, avoid late planting,	-	-

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
		poor drainage, higher doses of fertilizers, frequent irrigation, use resistant varieties		
	Fusarium basal rot	Crop rotation, mixed cropping with tobacco and sorghum, soil solarization, proper drainage, deep summer ploughing, avoid injury during cultural practices, flood soil in non-growing season, use resistant varieties		
	White rot	Use disease-free areas, crop rotation with cereal crops, hot water treatment of bulbs, soil solarization		
	Black mold	Leave garlic bulb for drying in the field, store seed and bulb after proper drying, maintain proper aeration in storage, avoid bruising of garlic bulbs		
	Bacterial rots (brown rot/soft rot/slippery skin)	Grow crop under optimum conditions, proper curing and rapid drying of bulbs, discard affected bulbs before storage, dry crop quickly after harvest, artificial curing during rainy season		
	Onion yellow dwarf disease	Manage vector population, plant virus-free transplants, crop rotation, remove and destroy diseased plants, rogueing of		Conserve predators (coccinellids, lacewings, spiders, wasps)

Crop	Pest	Cultural Treatment	Physical Treatment	Biological Treatment
		diseased plants, use blue sticky trap		
	Iris yellow spot disease	Plant healthy seedlings, crop rotation, eliminate alternate host plants, use sprinkler irrigation, avoid thin, patchy plant stands and crop stress		As in onion yellow dwarf disease

*- *As per requirement*

**- *Bacillus thuringiensis (Bt) is listed under Class III (slightly hazardous), but it is generally permissible in IPM practices. (WHO Pesticide Classification PDF, page 42)*
***- *The other biological treatments listed in the Chillies/Capsicum (e.g., Trichoderma harzianum, Trichoderma viride, Pseudomonas fluorescens, Nuclear Polyhedrosis Virus (NPV), Sulphur dust, and Neem oil) are not classified as hazardous in the WHO document, indicating they are generally permissible in biological pest management.*

3. Integrated Nutrient Management

3.3.1 Bio-fertilizers:

Bio-fertilizer is a vital component of integrated nutrient supply system in establishing high yield, high quality and high returns agriculture. Bio-fertilizers should have broad-spectrum adaptability, nitrogen fixation, phosphorus solubilization and potassium release ability.

Nitrogen fixation	The nitrogen fixing microbes in bio-fertilizers can transform molecular nitrogen in air (78-80%) which accounts to approx. 5300 tones into ammonium nitrogen (NH_4-N) and to supply plants for uptake and utilization. This is the mechanism of biological nitrogen fixation. These nitrogen fixing microbes combine and inhabit ate on the surface of plant roots and function as nitrogen fixation through the photosynthesis in leaves. These are of two types 1. *Rhizobia species* for legumes and pulse crops, 2. *Azotobacter* and *Azospirillum* for cereals, grasses, vegetables, oil seed, fruits and flowering plants.
Phosphorus solubilizers	Phosphorus solubilizers are also the biofertilizers which transform non-soluble (insoluble) and soil fixed phosphate into soluble phosphorus by utilizing the bio-acids which are produced from microbial fermentation processes. A number of P solubilizing organisms as bio-fertilizers available are PSB, phosphatica contain *Pseudomonas striata, Aspegillus awamoori* etc.

Bio-fertilizer use in crops: Pulse crops[9]

Pea	Use *Rhizobium* culture @ 24-30 g/kg seed, also use phosphorus solubilizer (*Bacillus polymyxa* or *Pseudomonas striata* or both mixture) @ 5 kg/ha as a soil application.
Mung and Urd	25-30 g/kg seed as seed treatment. For PSM use 5 kg PSM per ha as soil application.
Soybean	25-30 g/kg seed treatment + 5 kg per ha of PSM as soil application is recommended.
Frenchbean and Rajmah	30 g/kg seed treatment + 5 kg/ha of PSM as soil application.
Cowpea	25 g/kg seed treatment + 5 kg/ha of PSM. as soil application.

Bio-fertilizer use in crops: Horticultural Crops[10]

Citrus, Apple, Plum, Apricot, Pear, Peaches, Almond and Walnut	Mix *Azotobactor/Azospirillum* @ 10 kg and PSM @ 5 kg/ha with FYM/compost mix nicely in compost pit and fill the pit (0.75x0.75x0.75m) with the mixture of compost: soil (1:1).
Ginger and Termeric Colocassia	i) Use *Azotobactor* and *Azospirillum* in 1:1 ratio @ 5 kg/ha and 5 kg/ha PSM as soil application. ii) Prepare a solution of *Azospirillum* 2 kg and 2 kg PSM in 15 litter of water and dip the rhizome in the solution for 10-15 minutes and plant the treated rhizome in the evening.

[9] &

[10] Package of Practices- UDWDP-II, WMD, Uttarakhand

Bio-fertilizer use in crops :Vegetable crops[11]

Cabbage, Cauliflower, Tomato, Brinjal, capsicum and chillies	Use 10 kg/ha *Azospirillum* and 5 kg/ha PSM as soil application in furrows or broadcast. Prepare solution of 1 to 1.5 kg *Azospirillum* + 0.5 kg PSM in 5 litter of water. Dip the roots of seedlings in solution for 5 minutes and transplant.

3 IPM/INM/ICM through Farmers' Field School (FFS)

Farmers' Field School has proved as the best way to demonstrate IPM/INM/ICM. It is a non-formal type of educational learning situation wherein the participants will be able to acquire the skills and knowledge of integrated pest management through the integrated adoption of production technology in raising a healthy crop. At the end of the training farmers will –

- Become experts in their own field for arriving at right decision for pest management.
- Be able to conserve the defenders (natural enemies) in their field.
- Observe the crop regularly.
- Be able to grow healthy and safe/residue free crop.

The project will promote IPNM/ICM through farmer field school approach. The demonstrations will be undertaken in the key crops for wider replication. District wise plan will be developed with key crops and sample for demonstrations.

Along with the on field demonstrations, as part of the pest management strategy, the project will also promote the safe use of permissible pesticides (if any) as per the codes of practices described below:

Safe use of pesticides[12]

Storage

- Pesticides should be kept in a dry, locked store. Keep away from children.
- Take only sufficient pesticide for the day's application from the store to the site.
- DO NOT transfer pesticides from the original container and packing into other containers.

Application

- Identify the pest and ascertain the damage done.
- Use pesticide only if it has exceeded the Economical Injury Level.
- Use only the recommended pesticide which is the least toxic (from WHO class III and U only).
- Read the instructions manual of the pesticide and equipment.
- Check the spraying equipment and accessories to be used.
- Ascertain that all components are clean, especially filling and suction strainer, sprayer tank, cut-off device, and nozzle.
- Replace worn-out parts such as 'O' ring, seal, gasket, worn-out nozzle tip, hose clamps, and valves.
- Test the sprayer and ascertain whether it pumps the required output at rated pressure. Check the nozzle spray pattern and discharge rate.
- Calibrate the sprayer. Set spraying speed and nozzle swath by adjusting spray height and nozzle spacing.

[11] Package of Practices- UDWDP-II, WMD, Uttarakhand

[12] TNAU Agritech Portal, Tamilnadu Agricultural University, Coimbatore (https://agritech.tnau.ac.in/crop_protection/crop_prot.html)

- Make sure that appropriate protective clothing (overalls, boots, mask, goggles/face shield) is available and is used.
- Train all involved in the application and understand the recommendations. Ensure that soap, towel, and plenty of water are available.
- Recheck the use instructions of the pesticide and equipment.
- Make sure pesticides are mixed in the correct quantities.
- Avoid contamination of the skin, especially the eyes and mouth.
- Liquid formulation should be poured carefully to avoid splashing.
- Do not spray in high wind, high temperature, or rain.
- Avoid drift by selecting the proper direction of spraying and holding the nozzle and boom at a proper height.
- Start spraying near the downwind edge of the field and proceed upwind so the operator moves into the unsprayed area.
- Follow the correct spray technique. Spray the plant crop thoroughly by operating the sprayer at the correct speed and pressure.
- Prevent persons from entering treated areas until it is safe to do so.
- Mark the sprayed plots with a flag.
- Never eat, drink, or smoke when mixing or applying pesticides. NEVER blow out clogged nozzles or hoses with your mouth.
- Never allow children or unauthorized persons to be nearby during mixing. NEVER leave pesticides unattended in the field. Never spray if the wind is blowing toward grazing livestock or regularly used pastures.

Washing the Equipment and Disposal of Containers

- Remaining pesticides left in the tank after spraying should be emptied and disposed of in pits dug on wasteland.
- Never empty the tank into irrigation canals or ponds.
- Never leave unused pesticides in sprayers. Always clean equipment properly. After use, oil it and store it in the storeroom.
- Do not use empty pesticide containers for any purpose.
- Crush and bury the containers, preferably in a landfill dump.
- Clean buckets, sticks, measuring jars, etc., used in preparing the spray solution.
- Remove and wash protective clothing and footwear. Wash yourself well and put on clean clothing.

First Aid and Safety Measures

- Make sure appropriate protective clothing (overalls, boots, mask, goggles/face shield) is available and is used.
- Avoid contamination of the skin, especially the eyes and mouth.
- Handle liquid formulations carefully to avoid splashing.
- In case of contamination, wash the affected area thoroughly with soap and water.
- Prevent persons from entering treated areas until it is safe to do so.
- Ensure a first aid kit and plenty of water are available for emergencies.
- In case of accidental swallow, induce vomiting, take to the doctor immediately
- Follow the precautions listed on the containers.

Record Keeping

- Keep an accurate record of pesticide usage with names of pesticides, dosages, number of sprays etc. .

Additional details are given in Annexure IX.

Livestock

- The Project will promote good practices in the livestock interventions focusing on resource efficiency, pollution management and biodiversity conservation. The following guidelines will be promoted across the project are where the livestock interventions are promoted. Rearing of indigenous, native breeds will be encouraged after considering the economic feasibility. In case of breed improvement, the measures suggested by state breeding policy are to be encouraged.
    - For improvement of sheep breeds - pure breed Gaddi, Rampur bushair and Black sheep selective breeding is to be adopted through selected high quality Rams.
    - For improving goat breeds, selective breeding will be done amongst local goat breeds. In plain region, breeds are to be upgraded by Crossbreeding with Barbari and Jamunapari breeds. In hilly region mohair fibre should be encouraged by crossbreeding local goats with Angora bucks and to check inbreeding in germplasm at Govt. Angora Goat Breeding Farm, Gwaldam, Chamoli flocks would be replaced by new stock. In snowy and high altitude area of state Pashmina Goat Development and Breeding Programme shall be introduced.
- Open grazing ,especially near forest areas is to be avoided.
- Fodder cultivation will be promoted. Fodder trees will be encouraged on field bunds, agro forestry and in spring shed catchment areas
- Demonstration of Ration Balancing Programme (RBP) will be undertaken in livestock clusters/villages where livestock rearing is proposed. Community resources persons will be trained in handholding the farmers. Guidance will be taken from the Livestock Development board based on National Dairy Plan (NDP).
- Ethnoveterinary care will be encouraged through trainings and demonstrations with the help of community resource persons as feasible.
- Low cost housing/cattle sheds will be encouraged using eco friendly materials. The sheds will be scientifically planned to include proper ventilation, drainage, waste disposal etc. Adequate spacing will be provided per animal to avoid spread of diseases and unhygienic conditions.
- Wastes will be composted in pit method or through vermicomposting. The facility will be integrated into the cattle shed. In areas where feasible biogas plants will be promoted.
- Any biomedical wastes generating from the health camps will be disposed of safely by the animal husbandry department after prior treatment or through service providers

Agribusiness:

The Project will promote good practices in the agribusiness interventions focusing on resource efficiency, pollution management and environmental compliances. The following guidelines will be advocated for across the project are where the agribusiness interventions are promoted.

- In case of agriculture commodity processing, the consents to establishment (CtE) and Consent to Operation (CtO) will be taken from the state Pollution Control Board where applicable.
- In case of food processing and packaging FSSAI license will be taken
- No raw materials collection will be done without proper permits/licenses or it will be purchased through authorized markets/vendors only. Sustainable sourcing will be followed.
- Ground water extraction (where required) will be done after necessary permissions only
- The processing/manufactures facilities will be equipped with fire fighting equipment, first aid kits etc. and the emergency numbers will be displayed.
- The premises and equipment will be kept clean and maintained as per the prescribed standards. Wastes (if any) will be reused/recycled/disposed of safely
- Worker safety aspects will be adhered to based on the requirement. Health checkups will be organized where necessary.
- Hygiene standards will be followed.
- Proper labelling and certification of products etc. will be done where required.
- Water use efficiency and energy efficiency measures will be followed as applicable, which may differ from activity to activity
- All the applicable government rules and regulations will be followed and good practices (national and international) will be promoted to the extent possible

Spring shed Treatment:

The project will promote good practices and appropriate measures as part of spring shed treatment as applicable. Few measures are listed below. The mitigations will be integral part of technical manual.

- The excavation works for ponds etc. may require removal of vegetation, sometimes mature trees. In case of removal of mature trees, necessary permissions will be taken as applicable and compensatory plantation will be done of the same species or any other native species. The excavated earth will be reused for strengthening bunds etc. but will not be openly disposed.
- Plantations in catchment area will consider native species that are useful for local communities for fodder, fuel and nutrition purposes.
- Fodder grasses will be grown on the slopes for stabilization and pasturelands will be developed.
- Agro forestry will consider endangered, native species and organic methods of cultivation will be followed.
- The area where a village is located on the top of the hill with no forests above the village will be avoided
- The area will be avoided where land above the village is used for agriculture and no fallow land or forests are available for taking up recharge activities
- The spring shed/village with a steep or rocky hill above and where no recharge activities are possible to be avoided.
- Digging trenches on terraced fields to be avoided.
- Pine (Dhoopi) & other water-intensive plantations in upper catchments of drought-prone areas to be avoided
- Renewable energy to be used for pumping the water from water harvesting structures
- Promoting micro irrigation like drip, sprinkler and pivot irrigation, drip cum mulch
- Agronomic measures which will support soil conservation & improvement that includes suitable crop systems with multi-tier canopy and root characteristics, legumes covering soil for extended periods of time, and adding biomass to soil etc to be practiced to improve soil structure, organic carbon and help in harvesting maximum rain water.

Chapter-4

STAKEHOLDER ENGAGEMENT, DISCLOSURE, AND CONSULTATIONS

Stakeholder consultations are a vital mechanism for incorporating the perspectives of people who may be affected by a project and ensuring their concerns are addressed during design and implementation. Under the Uttarakhand Climate Responsive Rainfed Farming Project (UCRRFP), six consultations were held in six Gram Panchayats across Tehri and Haridwar districts. These were attended by representatives from the Watershed Management Directorate and the World Bank Safeguard team.

Key stakeholders included local community members (193 participants, of which 61 were women), Gram Panchayat representatives, self-help groups, and relevant government departments.

Main issues raised during consultations:

- **Crop damage by wild animals** (monkey, wild boar, elephant, rabbit, bear)
- **Water scarcity** in certain areas and need for irrigation channels/spring restoration
- **Soil erosion and land degradation** in river-adjacent areas
- **Underutilization of infrastructure** (polyhouses, biogas plants) due to lack of training
- **Livelihood diversification needs**, including tourism, value-added agriculture, and event-based entrepreneurship (e.g., Kanwar Yatra)
- **Lack of crop and livestock insurance**

Project responses incorporated into design:

- Promotion of **individual solar fencing** with partial community contribution for better maintenance
- **Restoration of springs** and creation of irrigation channels where feasible
- **Afforestation** and protection works in erosion-prone areas
- **Capacity building and training** on improved farming practices and infrastructure use
- Support for **livelihood diversification** through participatory rural appraisal (PRA) and community-led planning in Gram Panchayat Watershed Development Plans (GPWD Plans)

These consultations ensured that community priorities were integrated into project interventions, strengthening local ownership and enhancing the project's sustainability. A detailed Stakeholder Engagement Plan (SEP), prepared in line with World Bank's Environmental and Social Standard 10, provides the full process, disclosure methods, and responsibilities.

Chapter-5

GRIEVANCE REDRESSAL MECHANISM

Grievance Redress Mechanism (GRM)

The UCRRFP Grievance Redress Mechanism (GRM) is designed to ensure that project-affected persons (PAPs), community members, and other stakeholders can raise concerns or complaints related to project activities and receive timely, fair, and effective responses. The GRM will be accessible, inclusive, and transparent, and will operate at multiple levels to address grievances efficiently.

Step 1: Submission of Grievances

Grievances may be submitted through multiple channels, including:

- In writing (via complaint boxes placed in each Gram Panchayat)
- Verbally during community meetings or consultations
- By phone, email, or postal mail to the Watershed Management Directorate (WMD)
- Through the project website (www.wmduk.gov.in)
- Via designated project staff or implementing partners

Anonymous grievances will also be accepted and addressed. Information about the GRM will be widely disseminated through Information, Education, and Communication (IEC) materials and community outreach.

Step 2: Registration and Classification

All grievances will be recorded in a centralized grievance logbook or digital database maintained at the Gram Panchayat and WMD levels. Grievances will be classified based on their nature (e.g., environmental, social, labor-related, SEA/SH) and the profile of the complainant (e.g., vulnerable groups, women, transhumant populations). An initial acknowledgment will be provided within 3 working days of receipt.

Step 3: Resolution at the Gram Panchayat Level (Stage 1)

A local Grievance Resolution Committee (GRC) will be established at the Gram Panchayat level. The GRC will meet at least once a month to review and resolve complaints. The committee will include:

- A representative from the WWMC or RVC
- A Gram Pradhan or Panchayat Secretary
- A representative of the complainant (if applicable)
- A women's representative (preferably from a Self-Help Group)
- A social facilitator or MDT member

The GRC will aim to resolve grievances within 15 days. Meeting minutes will be documented and signed by all parties. If the grievance is resolved, the complainant will sign a closure form. If unresolved, the complainant will be informed of the next steps.

Step 4: Escalation to District and State Levels (Stage 2)

If a grievance cannot be resolved at the Gram Panchayat level, it may be escalated to the District Project Management Unit (DPMU) or the Project Management Unit (PMU) at WMD. The DPMU/PMU will review the grievance, consult relevant stakeholders, and provide a resolution within 30 days. The complainant will be informed in writing of the outcome.

Step 5: Legal and Other Mechanisms (Stage 3)

If the grievance remains unresolved, the complainant may seek redress through formal legal channels, including:

- Filing a complaint under the Right to Information (RTI) Act
- Approaching the State Ombudsman or Lokayukta
- Seeking judicial remedy through civil courts

Special Provisions for SEA/SH Complaints

Complaints related to Sexual Exploitation and Abuse (SEA) or Sexual Harassment (SH) will be handled with strict confidentiality and sensitivity. A dedicated SEA/SH focal point will be designated at the PMU level. Such complaints will be addressed through a survivor-centered approach, and referrals will be made to appropriate support services.

GRM Focal Point and Contact Information

The GRM Focal Point at the PMU will be responsible for:

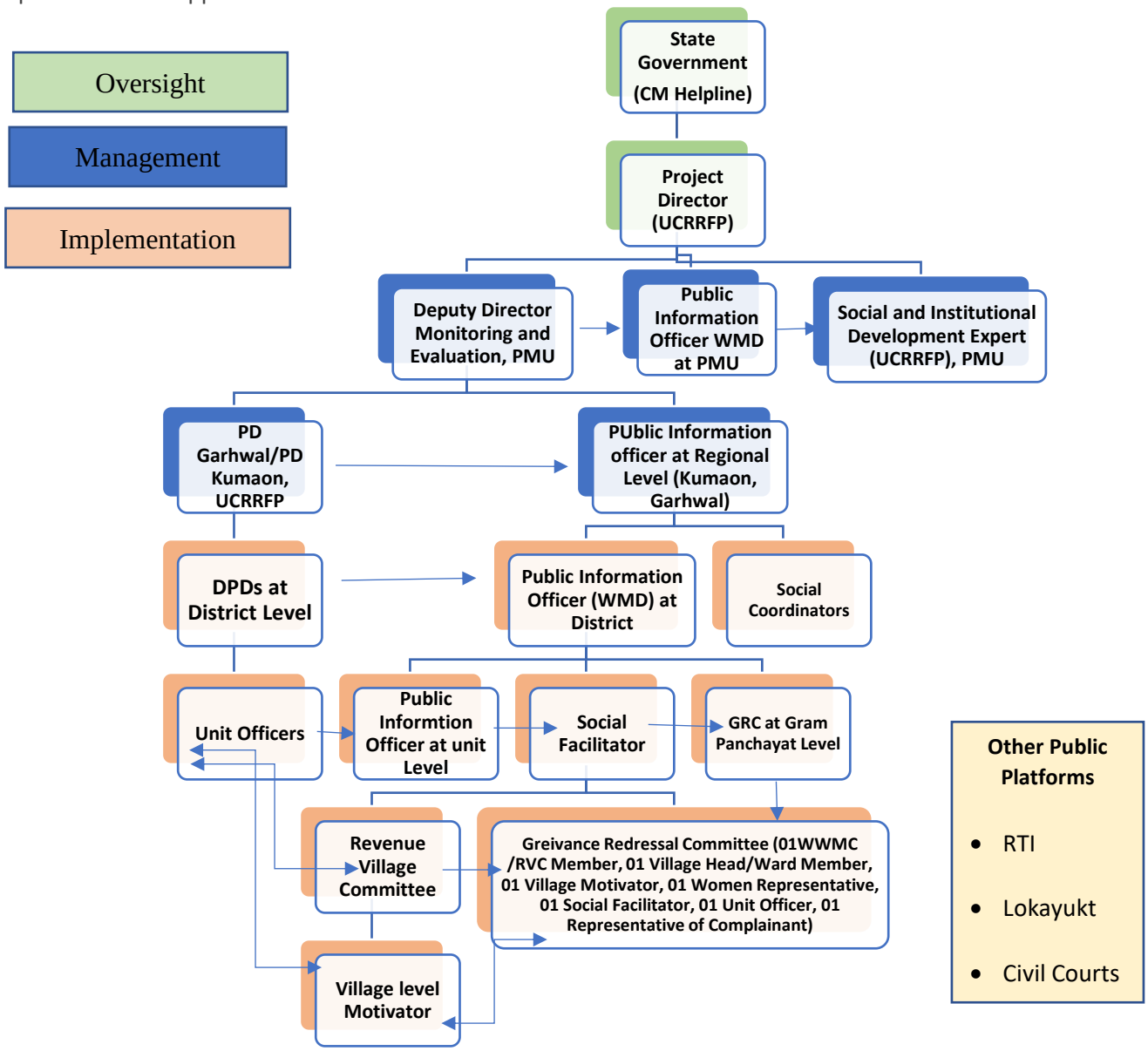
- Maintaining the grievance database
- Coordinating with field teams and GRCs
- Ensuring timely resolution and reporting

Contact details:

- Email: wmd-ua@nic.in
  - Postal Address: Chief Project Director, Watershed Management Directorate, Indira Nagar Forest Colony, Dehradun, Uttarakhand – 248006
  - Website: www.wmduk.gov.in |

Monitoring and Reporting

All grievances and their resolution status will be tracked and reported in the project's quarterly and annual reports. The PMU will maintain a grievance dashboard and share updates with the World Bank as part of regular implementation support missions.



Grievance Institutional Management and Implementation Process

To ensure timely, inclusive, and transparent grievance redressal under the UCRRFP project, a multi-tiered mechanism has been instituted across all project levels—ranging from village to PMU. This mechanism defines clear responsibilities at each level of project governance to address and resolve community grievances effectively.

At the PMU Level, designated officials will be responsible for handling grievances received directly at the state level. If a grievance is received at the PMU, the Deputy Project Director (Monitoring & Evaluation) will forward the case to the Public Information Officer (PIO), who will coordinate with concerned field officials to gather relevant details and ensure timely resolution. The PMU Social Expert will assist the PIO in tracking grievance progress and facilitating follow-ups. In cases where grievances remain unresolved despite repeated efforts, the PMU may constitute a three-member Supervision Committee to investigate and resolve the matter in an impartial and transparent manner.

At the Regional Level, Regional Officers in Garhwal and Kumaon divisions will oversee the grievance redress process within their jurisdiction. Grievances received at the regional level will be handled by the PIO of that region, who will ensure their resolution by escalating the matter to the district level and monitoring the progress until closure. Additionally, they will monitor district-level progress and provide necessary support to ensure the timely resolution of cases.

At the District Level, the Deputy Project Director (DPD) and district officials will be responsible for addressing grievances reported within their respective areas. Grievances will be reviewed during monthly coordination meetings with block/unit officials. A suggestion box will be installed at the District Office to collect community feedback, and a grievance register will be maintained in the prescribed format. The Social Coordinator will assist the DPD and PIO in tracking grievance resolution and compiling updates in monthly social reports. Grievances that remain unresolved at the district level will be escalated to the PMU through the respective Regional Director (Garhwal/Kumaon).

At the Block/Unit Level, Unit Officers and Public Information Officers will be responsible for handling grievances emerging at the Gram Panchayat or unit level. Regular review of new and pending grievances will take place in scheduled meetings at the GP, block, and unit levels. Suggestion boxes and grievance registers will be maintained at this level, as per the project format. The Social Facilitator will assist with tracking and monthly reporting of grievances. Cases that cannot be resolved at the unit level will be forwarded to the district level.

At the Gram Panchayat Level, a local Grievance Resolution Committee (GRC) will be formed to address community concerns in a participatory and transparent manner. This committee will meet at least once a month to review all registered complaints and undertake necessary steps for their resolution. The GRC will include a representative from the Watershed Management Committee (WWMC) or Revenue Village Committee (RVC), the Gram Pradhan or Panchayat Secretary, a representative of the complainant (if applicable), a women's representative—preferably from a Self-Help Group (SHG), and a Social Facilitator or Multidisciplinary Team (MDT) member. Suggestion boxes and grievance registers will be installed in each GP to encourage community feedback. The Social Facilitator will be responsible for ensuring these provisions are in place and functional. If a grievance cannot be resolved at the GP level, it will be escalated to the Unit level.

At the Revenue Village Level, suggestion boxes and grievance registers will be installed to capture feedback at the most local level. The Village Facilitator, with support from the Social Facilitator, will ensure that these tools are operational in each Revenue Village. The RVC will review received grievances during their meetings and forward unresolved issues to the GRC at Gram Panchayat Level. If a grievance remains unresolved at the GP level, it will be escalated to the Unit level for further action.

Open Access Provision: Any individual who is dissatisfied with the resolution process at any level may directly approach the PMU or raise the matter through public platforms such as the Chief Minister's Helpline, RTI Act, or the Lokayukt. This ensures transparency and empowers stakeholders to seek redress beyond the standard institutional channels.

Table:5.1 Format for Grievance Register

S. No.	Name of the Complainant	Village Name	Date of Grievance Received	Type of Grievance	Details of Grievance	Action Required	Date of Resolution	Satisfactory Letter Received (Yes/No)	Any Other Details
1									
2									
3									

ANNEXURES

Annexure-1 - **ENVIRONMENTAL AND SOCIAL ASSESSMENT OF PROPOSED GPRP ACTIVITIES TO BE DONE BY RVC/ WWMC ALONG WITH PROJECT MDT**

To be filled up by RVC and WWMC being facilitated by Project MDT for selecting project activities in GPRP.

Put **X** for negative impacts and **√** for positive or no negative impacts.

Sl. No	**Project activities**	**Codes for possible environnemental impacts (Reference to Table-2)**																		**Codes for possible social impacts (Reference to Table-2)**										**Mitigation measures (Code, as mention in the ESCP-Annex-II)**
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	**Z_1**	**Z_2**	**Z_3**	
	Horticultural Development																														
1.	Bio Compost																														
2	Vermi- compost																														
3.	Homestead Plantation																														
	Livestock Management																														
4.	Mangers																														
5.	Animal chari																														
6.	Napier Crop Border Plantation																														
7.	Forage row plantation																														
	Forestry																														
8.	Afforestation (1000 plants/ ha.)																														
9.	Fodder/Pasture Plantation																														
10.	Assisted Natural Regeneration of Oak Areas																														
	Soil & Moisture Conservation																														
11.	Recharge pits																														
12.	Digging of Contour trenches																														
13.	Chal Khal																														
14.	Dugout Ponds																														
15.	Construction of vegetative check dams (in Number)																														

Sl. No	Project activities	Codes for possible environnemental impacts (Reference to Table-2)																		Codes for possible social impacts (Reference to Table-2)										Mitigation measures (Code, as mention in the ESCP-Annex-II)
16.	Construction of dry stone check dams																													
17.	Construction of crate wire check dams																													
18.	Cemented Check Dams																													
19.	Crate Wire Retaining Walls																													
20.	Diversion drains to control soil erosion from arable lands																													
	Rainfed Irrigation Initiatives																													
21.	HDPE Irrigation Pipelines																													
22.	Irrigation Tanks																													
23.	Small Water Storage/Harvesting Tanks																													
24.	LDPE Tanks																													
25.	Pre Fabricated Geo Membrane Water Harvesting Tanks																													
26.	Village Irrigation Ponds																													
	Preventing Crop Depredation																													
27.	Chainlink fencing to secure agricultural lands																													
	Energy Conservation																													
28.	Bio Gas Plants																													

Table 1 CODES FOR POSSIBLE ENVIRONMENTAL AND SOCIAL IMPACTS OF PROJECT INTERVENTIONS
(To be filled in above Format 2, as negative or positive for each project activity)

Codes	Environment Impacts
A	Impact on Surface Water (Quality/Quantity)
B	Possibilities of Siltation in water bodies (existing/constructed)
C	Soil Erosion/Gully Formation
D	Impact on stability of Hill Slopes/chances of Landslides
E	Impact on Soil Quality
F	Soil Moisture regime
G	Impact on Agricultural Productivity (Grain/Fodder)
H	Water/Air / Noise Pollution
I	Pressure on Surrounding Trees and Vegetation
J	Forest Fire
K	Impact on Biodiversity (Flora/Fauna)
L	Impact on Aquatic Life
M	Invasion of Exotic Species
N	Impact on Rare, Threatened & Endangered Species
O	Impact on the existence of plant species of Medicinal Importance
P	Generation/accumulation of Solid Waste/ Wastewater
Q	Impact due to the use of Chemical Fertilizers/Pesticides
R	Impact (danger of extinction) to the Local Gene Pool (Plants/Crops)
S	Impact on Human Health and Safety
	Social Impacts
T	Impact of the activity on Workload/drudgery (particularly on women)
U	Impact on availability of Nutritious Food
V	Dislocation/migration of People due to loss of traditional livelihood/ Local Labour
W	Impact on Benefits and Legal rights of vulnerable, SC/ST, transhumant and people belonging to other Marginalized Groups.
X	Use of Child Labour

Y	Impact related to Insect, Pest and Wildlife Attacks
Z	Impact of the intervention on Places of Religious/Historical Importance/Monuments
Z_1	Social Conflicts (benefit sharing)
Z_2	Effect of the activity on Human Health
Z_3	Effect of the activity on Local Cultural/Ethical/Aesthetic Values

Annexure-II Environmental and Social Code of Practices (ESCPs)

SN	Subprojects/activities	Code No.	Measure/Guideline
	FORESTRY	EC F 1.1	All plantation activities should be done in accordance with Manual of Forestry.
		EC F 1.2	Preference should be given to the local endemic species for plantation.
		EC F 1.3	Select native fodder species with high nutritive value.
		EC F 1.4	Plantation of mixed broadleaf species to supplement fodder.
		EC F 1.5	To increase the availability of local fodder/fuel, agro-forestry practices should be promoted.
		EC F 1.6	Plantation of fodder species in unculturable wastelands.
		EC F 1.7	Van Panchayats and Biodiversity groups in the GPs should be mobilized to ensure a higher sense of ownership and commitment towards sustainable management of common forest lands.
		EC F 1.8	Equal sharing of resources among users by rules/regulation.
	SOIL & WATER CONSERVATION	EC SC 2.1	Levelling of crop fields and maintenance of terraces / bunds to check water runoff and soil loss.
		EC SC 2.2	Storage of surface/Rain water through water storage structures.
		EC SC 2.3	Vegetative soil conservation measures around the engineering structures (bio-engineering measures).
		EC SC 2.4	Main streams/rivers, of MW/SWS, should be treated through Retaining Wall like stream bank protection activities instead of Cross barriers/ Check dams.
		EC SC 2.5	Quarrying for stones prior to construction of any structure in a site should strictly prohibited. The engineering structures for DLT should be constructed from loose bolder/stones lying alongside the drainage line.
		EC SC 2.6	Use of stone riser technique for field bonding should be adopted as a preventing measure to check soil erosion.
			Any other stie specific measures
	AGRICULTURE/ HORTICULTURE	EC AG 3.1	High nutritional value traditional crops should not be totally replaced by high yielding varieties.
		EC AG 3.2	To maintain soil fertility, crops rotation and bringing the cultivated land under leguminous crops (pea, lentil etc.) should be practiced.
		EC AG 3.3	To maintain biological fertility of the soil, planting of nitrogen fixing species on the crop field bunds should be done.
		EC AG 3.4	Selection of low water demanding (high efficiency in water utilization) HYV crops should be given preference.
		EC AG 3.5	Protected cultivation (use of polyhouse, polypit, polytrench, etc.) to reduce the chances of HYV crop failure

SN	Subprojects/activities	Code No.	Measure/Guideline
	Integrated Crop Management (ICM)	EC ICM 4.1	Site-specific suitable crops should be grown followed by soil testing.
		EC ICM 4.2	To retain soil health and reduce soil contamination & water pollution, use of bio-fertilizers (bio-compost, vermicompost, organic mulch (Green manure), microbial inoculants, etc.) and bio-pesticides should be promoted.
		EC ICM 4.3	Lesser use of permissible chemical fertilizers / pesticides (Annex 6 & 7) will reduce chances of soil contamination and water pollution.
		EC ICM 4.4	Plantation/protection of pest controlling plants (Marigold, etc.).
		EC ICM 4.5	Adoption of IPM package along with following cultural practices should be promoted.
		EC ICM 4.5.1	Deep ploughing
		EC ICM 4.5.2	Line sowing
		EC ICM 4.5.3	Mix cropping
		EC ICM 4.5.4	Use of Organic Manure
		EC ICM 4.5.5	Seed Treatment
		EC ICM 4.5.6	Base dose Application
		EC ICM 4.6	Use of permissible chemical pesticides should only be done in accordance to the application timings and safety measures mentioned in IPM strategy of the project.
	WATER HARVESTING	EC WH 5.1	Rain water harvesting and storage of surface water (of streams, nalla, etc.) through water storage ponds/pits should be encouraged.
		EC WH 5.2	Construction of Roof Rain Water Harvesting Tank will help to collect rain water for domestic uses and kitchen gardening.
		EC WH 5.3	In rainfed areas, Low Density Polyethylene Tanks should be encouraged to collect rain/source water for irrigation.
		EC WH 5.4	Regular disinfection by chlorination and use of filters in storage structures will reduce chances of water borne diseases.
		EC WH 5.5	Proper designing, size and site selection for channel should be ensured.
		EC WH 5.6	Construction of smaller underground tanks to reduce chances of leakage.
		EC WH 5.7	Use of Ferro-cement for repairs of tanks.
		EC WH 5.8	Deep wells may not be dug to reduce drawing of underground water.
		EC WH 5.9	Disposal of waste water away from the ponds and proper drainage
		EC WH 5.10	Fish rearing to consume the mosquito eggs.
		EC WH 5.11	Rules and regulations over sharing and rational use of water to be framed by the stakeholder communities.
		EC WH 5.12	Selection of site for community water storage tanks should be as per the convenience and cooperation of stakeholders to reduce conflicts among users.

SN	Subprojects/activities	Code No.	Measure/Guideline
		EC WH 5.13	Installation / lying of pipelines deep in the ground will reduce freezing of water and.
		EC WH 5.14	Compaction of the excavated soil in the dug pipelines
		EC WH 5.15	Skill development among villagers to repair / maintain the pipelines
		EC WH 5.16	Strengthening of traditional local institutions will also help to sort out conflict among users.
		EC WH 5.17	Construction of water harvesting or water supply structure in individual and community land should be done only with the consent and the approval of the beneficiaries and Gram Panchayats.
		EC WH 5.18	The benificiaries should form usergroups and these groups themselves should be reach to an agreement prior to construction of water harvesting structures on any ones private land belonging the group.
	LIVESTOCK	EC LS 6.1	Animal health camps should be organised under supervision of technical experts.
		EC LS 6.2	Farmers should be encouraged for periodic vaccination to protect livestock from epidemic diseases.
		EC LS 6.3	To treat livestock, use of herbal medicines should be encouraged.
		EC.LS.6.4	Local fodder crop/ grass species should be encouraged.
		EC LS 6.4	Use of organic manure/bio-fertilizers should be encouraged for fodder crop production.
		EC LS 6.5	To reduce biotic pressure on forest, farmers should be encouraged to adopt new livestock techniques, like stall feeding, breed improvement, improve fodder production etc.
	AGRIBUSINESS	EC AB 7.1	Use of hardy local improved varieties for cultivation will reduce the use of chemical fertilizers and pesticides.
		EC AB 7.2	Cultivation of improved local varieties to reduce threat on local gene pool.
		EC AB 7.3	Use of alternate non wood staking material.
		EC AB 7.4	Use of bio-products for packaging
		EC AB 7.5	Safe disposal of organic and inorganic waste separately, as per waste management guidelines of WMD(Annexure-XII)
		EC AB 7.6	Crop diversification and intercropping according to market requirement and as natural pest barrier.
		EC AB 7.7	Proper pollution control arrangements in food processing units. FSSAI permits
		EC AB 7.8	The FIGs/ FFs, which will be responsible to run the processing unit/grading center, should have an agreement prior to establishment/construction of such unit with GP or individual (as applicable), to whom the land will belongs.
	INCOME GENERATING ACTIVITIES (IGA)	EC IGA 8.1	Strengthening of village resource management institutions to reduce conflicts among the users over common resources
		EC IGA 8.2	Prohibited use of species to avoid over exploitation.
	Potential IGAs-	EC.IGA.8.3	

SN	Subprojects/activities	Code No.	Measure/Guideline
	1. NTFPS 2. Decorative items 3. Wood craft 4. Bamboo products 5. Nursery 6. Mushroom 7. Beekeeping 8. Fish farming 9. Woollen products	EC IGA 8.4	Use of water saving techniques / water harvesting to meet demand of water in IGA activities.
		EC IGA 8.5	Awareness among the users and proper training will help the users in mushroom and fish farming activities.
		EC IGA 8.6	Processing of wool washing not be done directly in water sources.
		EC IGA 8.7	Use of masks or nose cover (cloth) during wool processing.
	NEED BASED INFRASTRUCTURE DEVELOPMENT	EC IF 9.1	Treatment of the destabilized sites through vegetative measures, jute netting, etc.
		EC IF 9.2	Quality of constructions should be ensured to reduce the failure and more hazards in downstream areas.
		EC IF 9.3	Proper designing and planning for road construction/laying to reduce soil erosion/landslips.
		EC IF 9.4	Bio-physical measures to rehabilitate disturbed land and checking soil erosion.
		EC IF 9.5	The land, not suitable for other productive purposes should be brought under infrastructure activities.
		EC IF 9.6	Preference to marginal groups in local employment.
		EC IF 9.7	Construction of any structure in individual or community land should be done only with the consent and the approval of the beneficiaries and Gram Panchayats.
		EC IF 9.8	Construction of assets of common benifits should be strictly prohibited in the lands which belongs to vulnerable group members.
	USE OF ALTERNATE ENERGY SOURCES	EC AE 11.1	Alternative means of energy should conserve the adjoining forests and provide to meet the needs of the people
		EC AE 11.2	Environment friendly alternative energy sources and/or the energy saving devices should be installed on priority basis to share the labour put in by womenfolk to collect fuel wood.
	Biogas	EC AE 11.3.1	It is to be insured that the installed bio-gas plant is of good quality standards and leak proof to avoid accidents due to leakage of methane.
		EC AE 11.3.2	User should be aware about proper dung to water ratio and to avoid any gap between 2 slabs covering the slurry outlet tank to reduce mosquito breeding.
		EC AE 11.3.3	To fulfil the higher water requirement per day, in the House Holds having Biogas, the water availability issue should be also taken care.
		EC AE 11.3.4	Training should provide for the proper use and awareness to avoid accidents.
	Solar equipment	EC AE 11.5.1	Components of waste/unused batteries of solar equipment are hazardous to health so there safe disposal through PCB registered recyclers should be ensured.

Annexure III Mitigation measures for negative impacts and indicators

Subprojects/activities	Negative Impacts	**Mitigation Measures**	**Indicators**
FORESTRY **1.** Afforestation **2.** Silvi-pasture	▪ Introduction of exotic species. ▪ Proliferation / dominance of invasive / exotic species ▪ Conflict among user over resource sharing • Shortage of grazing land during initial phase. • Restrict rights of the people	• EC F 1.1 • EC F 1.2 • EC F 1.3 • EC F 1.4 • EC F 1.5 • EC F 1.6 • EC F 1.7 • EC F 1.8 • EC F 1.9	• Area covered under afforestation (ha). • Increase/decrease in fodder / fuelwood yield. • Decrease/increase in women labour (days) for collection of fuel wood and fodder. • Increase/decrease in number of Oak seedlings/sapling (Nos, %). • Increase/decrease in forest crown cover/ canopy closure (Ha). • Increase/decrease in soil moisture. • Increase/decrease in forest floor vegetation and litter layer thickness (cm). • Reduction/increase in occurrence of fire incidences (Nos, %).. • Increase/decrease in forest wealth (resin, NTFPs, leaf litter layer, fodder etc.). • Increase/ decrease in the use of non- chemical applications e.g.,bio-pesticides, mechanical, cultural activities (No of sprays and Ha). ▪ All receive benefits.

Subprojects/activities	Negative Impacts	**Mitigation Measures**	**Indicators**
AGRICULTURE 1. High Yielding Varieties 2. Diversified Agriculture 3. On-Farm Cultivation (Vegetables, spices and condiments) 4. Terrace Repair 5. Vegetative Boundary	• Loss in soil moisture. • Loss in soil fertility (Nitrogen, Carbon, etc.). • Soil and water pollution due to use of pesticides. • More demand of water for irrigation and competing demands on surviving/existing sources which are used for drinking. • Pressure on local forests/ vegetation for fodder for animals and packaging material. • Loss of traditional / indigenous practices of crop cultivation. • HYVs are labour intensive and bring more workload on women. • Marginal groups (landless farmers/labourers) will benefit less, since they do not have land to bring under HYVs • Due to monoculture chances of crop failure due to frost/fog, insect/pest and diseases. • Discontinuation of barter system and more dependency on external resources / agents and, therefore, loss of self-dependency. • Possibility of loss of local races/cultivars/gene pools/ crop varieties • Conflicts among the neighbouring farmers due to the shade caste from vegetative field boundary	• EC AG 3.1 • EC AG 3.2 • EC AG 3.3 • EC AG 3.4 • EC AG 3.5 • EC ICM 4.1 • EC ICM 4.2 • EC ICM 4.3 • EC ICM 4.4 • EC ICM 4.5 • EC ICM 4.5.1 • EC ICM 4.5.2 • EC ICM 4.5.3 • EC ICM 4.5.4 • EC ICM 4.5.5 • EC ICM 4.5.6 • EC ICM 4.6 • EC F 1.5 • EC SC 2.1 • EC SC 2.6 • EC WH 5.2 • EC WH 5.3	• Damage to crops (resistance against diseases, frost, drought etc.) (%) • Production of grain, straw and other plant products • Quality of production (taste, odour, colour, perishability etc.) • Increase/decrease in per unit land economic benefits • Changes in nature of soil (fertility, hardness, moisture, colour etc.) • Quantity of seeds produced (Kgs) • Reduction/increase of soil erosion and water runoff • Increase / decrease in work load on women • Number of local crop varieties grown and area under them • Increase/ decrease in the use of non- chemical applications e.g.,bio-pesticides, mechanical, cultural activities. • No. of farmers adopting the ICM/IPM/INM/IWM. • Percent of area under minimum 3 ICM practices

Subprojects/activities	Negative Impacts	**Mitigation Measures**	**Indicators**
HORTICULTURE **1. Fruit Crops**	• Soil contamination due to use of chemical fertilizers and pesticides and herbicides. • Increase in water consumption, therefore depletion in water resources. • Increase in water pollution due to use of pesticides / fertilizers. • The marginal landholders will benefit less, as they may not have land to bring under horticulture. • Health hazards due to more use of chemical fertilizers & pesticides	• EC ICM 4.2 • EC ICM 4.3 • EC AG 3.4 • EC SC 2.2 • EC IF 9.7	• Increase or decrease of production of fruits and other plant products • Quality of production (taste, odour, colour, perishability etc.) • Increase / decrease in economic benefits per unit land • Damage of crops against diseases, frost, drought, etc. • Increase/ decrease in the use of non- chemical applications e.g.,bio-pesticides, mechanical, cultural activities, climate resilient varieties, soil test based fertilizer application, restriction of non-permissible pesticides etc. • MRL Testing results within permissible limits
WATER HARVESTING 1. Village Pond 2. Irrigation Ponds 3. Roof water harvesting 4. LDPE Tanks	▪ Water logging due to improper drainage. ▪ Water pollution through deposition of waste materiel due to public use. ▪ Pollution through organic (Polyethylene/ plastic) waste by the use of LDPE sheets and plastic pipelines for water harvesting. ▪ Health impacts due to breeding of mosquitoes. ▪ Disputes over water sharing (domestic demand vs irrigation demand) may arise. ▪ Mud formation along the water distribution points ▪ Marginal farmers are deprived from the benefits as they have small holdings. • More chances of water borne diseases if the unclean water is consumed without treatment • Seepage/leakage in roof tops and under water tanks. • Drawing of underground water may lead to shortage of water in other adjacent sources.	▪ EC WH 5.1 ▪ EC WH 5.2 ▪ EC WH 5.3 ▪ EC WH 5.4 ▪ EC WH 5.5 ▪ EC WH 5.6 ▪ EC WH 5.7 ▪ EC WH 5.8 ▪ EC WH 5.9 ▪ EC WH 5.10 ▪ EC WH 5.11 ▪ EC WH 5.12 ▪ EC WH 5.13 ▪ EC WH 5.14 ▪ EC WH 5.15 ▪ EC WH 5.16 ▪ EC WH 5.17 ▪ EC WH 5.18	• Increase/decrease in water use efficiency for all activities e.g., household consumption, irrigation, drinking, etc. • Increase/decrease in irrigated area • Increase/decrease in crop production • Increase/decrease in water quality (colour, taste, odour) • Decrease/increase in time and distance per day put in for collection of water • Access to water by the marginalized groups • Alternate livelihood for those vulnerable whose land may be affected. ▪ Access to transhumant to meet their water requirements.

Subprojects/activities	Negative Impacts	**Mitigation Measures**	**Indicators**
	• Deposition of excavated soil damages the surrounding vegetation • Conflicts among the users/owners of the land where the well is dug. • Due to freezing of water in winters, water pipes get damaged and water supply gets interrupted. • Difficult on the part of villagers to maintain / repair pipelines. • Loss of land		
LIVESTOCK (Small Ruminants) 1. Natural breeding (Small Ruminant) 2. Fodder management 3. Veterinary camps	• Introduction of exotic/alien species of grasses and fodder crops to meet the demand of fodder, that dominate the local species. • Hybrid animals are more prone to diseases. • Hybrid animals require more provisions for health care. • Limited breeding facility (a bull can serve only 2 animals in a week) in case of hybrid animals. • Hybrid animals require intensive care attention. • Improper treatment of grasses or straw might lead to food poisoning. • Dependency on professionals in the artificial insemination and other activities and in the absence of professionals quality of service will deteriorate. • Poor quality vaccination may increase the out-break of diseases.	• EC LS 6.1 • EC LS 6.2 • EC LS 6.3 • EC LS 6.4 • EC LS 6.5 • EC LS 6.6	• Reporting of animal coverage. • Reduction in diseases/ disease outbreaks. • Production of milk, meat enhancement. • Overall improvement/deterioration in productivity of milk, meat etc. • Quantity of fodder saved/consumed. • Enhancement/decrease in fodder production. • Increase/reduction in work load of women. • Changes in animal type (animal composition). • Increase/ decrease in the use of drugs and pesticides. • Facilities extended to transhumant.
CONSTRUCTION ACTIVITIS / INDUCED DEGRADATION **1. Drainage line treatment**	• Soil loss during the construction of engineering structures and quarrying for stone and other materials • Siltation of water bodies downstream during the construction of engineering measures.	• EC IF 9.1 • EC IF 9.2 • EC IF 9.3 • EC IF 9.4 • EC IF 9.5	• Conservation of soil measured by stabilized erosivity, gullies etc. • Reduction/increase in the frequency of slope slippages , debris flow, swollen streams, flash flood in downstream

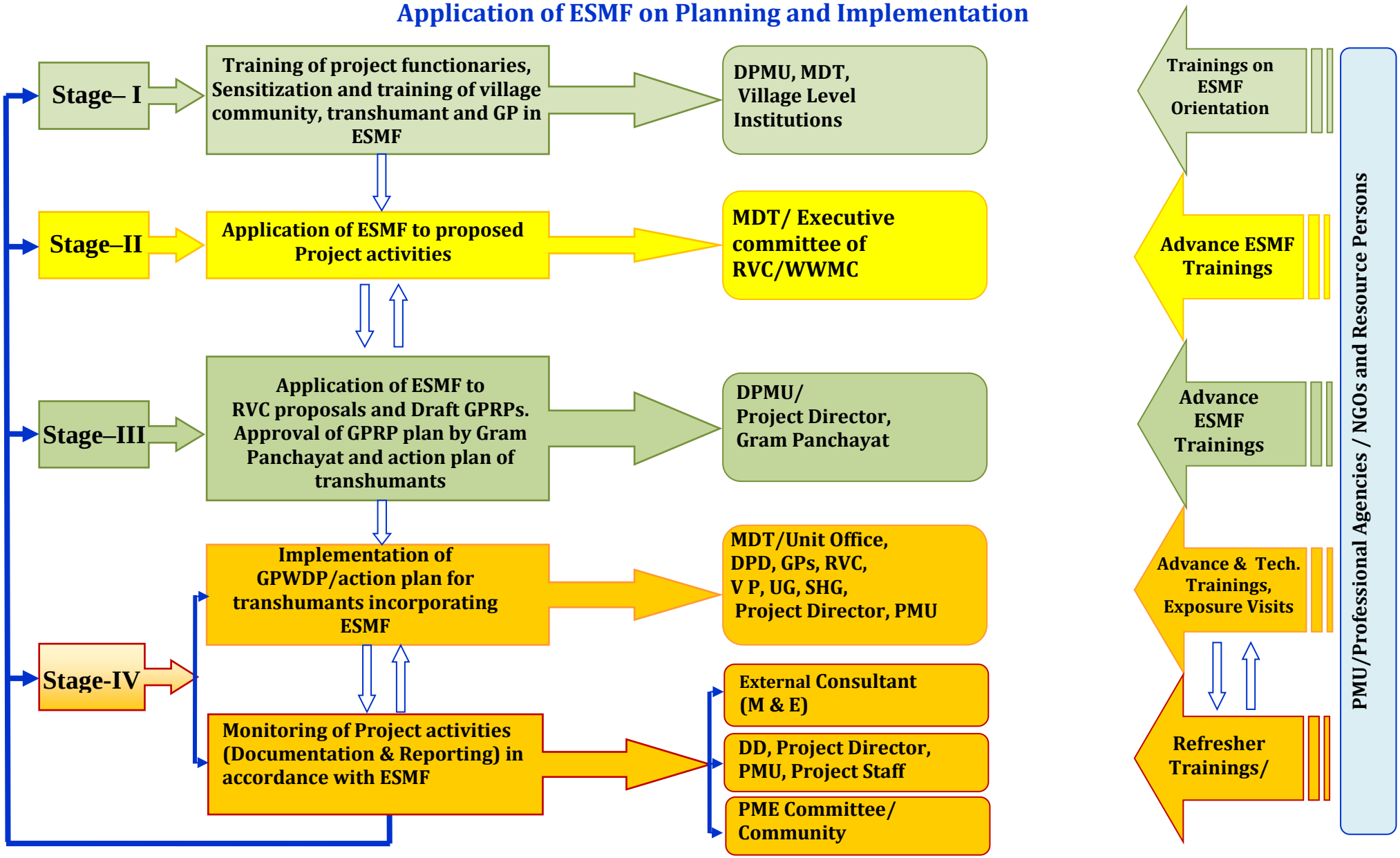
Subprojects/activities	Negative Impacts	**Mitigation Measures**	**Indicators**
2. Soil and water conservation works **3. Storage & Marketing facilities**	• Maintenance of the structures will require additional responsibilities to the stakeholders. • Low quality constructions may lead to failure and more hazards in downstream • Destabilization of the land and soil erosion/landslips along the road cuttings. • Siltation of water bodies downstream due to runoff. • Destruction of local flora during road construction and also along the roads. • Construction of the structures may cause some soil erosion. • Deterioration of cultural institutions (such as barter systems, helping attitude etc.)	• EC IF 9.6 • EC IF 9.7 • EC IF 9.8 • EC SC 2.1 • EC SC 2.2 • EC SC 2.3 • EC SC 2.4 • EC SC 2.5 • EC SC 2.6	• Increase/decrease in water yield in the downstream sources and duration of water discharge • Increase/decrease in number of link paths • Availability/non-availability in off-season food products • Increase / decrease Productive land use for infrastructure • Improvement in incomes of vulnerable groups (child labour) and leisure time. • Increase /decrease in nutrition and education levels

Subprojects/activities	Negative Impacts	**Mitigation Measures**	**Indicators**
INCOME GENERATING ACTIVITIES (IGA) 1. NTFPS 2. Decorative items 3. Wood craft 4. Bamboo products 5. Nursery 6. Mushroom 7. Beekeeping 8. Fish farming 9. Woollen products	• Conflict among the users over common resources • Chances of excessive harvest of a particular species / plant parts • Destabilization of stabilized slopes dug to remove soil for plant raising in the nursery • More demand for water for many IGA activities. • Risk of food poisoning due to unaware use of over grown / decayed mushroom. • Chances for economic risk due to death of fishes due to diseases. • Water pollution due to processing of wool for making products. • Possible occupational health hazards during wool processing.	• EC IGA 8.1 • EC IGA 8.2 • EC IGA 8.3 • EC IGA 8.4 • EC IGA 8.5 • EC IGA 8.6 • EC IGA 8.7	• Number of plants of different species raised • Increase/decrease in productivity. • Increase/decrease in income of beneficiary. • Participation of vulnerable groups in decision making at the watershed level.

Subprojects/activities	Negative Impacts	**Mitigation Measures**	**Indicators**
AGRIBUSINESS **1-HYV cultivation** **2-Polyhouse** **3-Collection/Processing Canters**	• Increase in use of chemical pesticides/ insecticides. • Threat to local crops/species. • Exploitation of local shrubs and tree branches for staking purposes for climbers and tomato. • Spread of organic/inorganic waste like fruit peel, seeds, pulp and poly sheets etc. • Monoculture (of a particular Species or variety) results in decreased disease & pest resistant. • Threat to nutritional security of the area. • Air and water pollution by food processing units.	• EC AB 7.1 • EC AB 7.2 • EC AB 7.3 • EC AB 7.4 • EC AB 7.5 • EC AB 7.6 • EC AB 7.7 • EC AB 7.8 • EC ICM 4.1 • EC ICM 4.2 • EC ICM 4.3 • EC ICM 4.4 • EC ICM 4.5 • EC ICM 4.5.1 • EC ICM 4.5.2 • EC ICM 4.5.3 • EC ICM 4.5.4 • EC ICM 4.5.5 • EC ICM 4.5.6 • EC ICM 4.6 •	• Business plan with accordance to local climate/ conditions. • Species that are hardy and local. • Crop diversification. • Use of alternate staking material. • Arrangements for safe disposal of waste and controlling pollution in processing canters.
ALTERNATE ENERGY SOURCES	• Higher demand of water for bio-gas plants could create problems in the areas of water scarcity. • Chances of increased mosquito breeding at slurry outlet tank. • Hazard of accidents by leakage of methane gas. • In the households with bio-gas plants, the per day requirement would be higher. • Charring of pine needles would produce harmful smoke. • Fire hazard during charring.	• EC AE 11.1 • EC AE 11.1.1 • EC AE 11.1.2 • EC AE 11.1.3 • EC AE 11.1.4 • EC AE 11.2.1 • EC AE 11.2.2 • EC AE 11.2.3 • EC AE 11.3.1	• Level of awareness to use alternate energy devices. • Quality standards and safety measures taken for establishment/use of biogas plant. • Disposal of inorganic waste.

Subprojects/activities	Negative Impacts	**Mitigation Measures**	**Indicators**
	• Hazard of electric shock during the use of briquette moulding machine. • Pollution and health hazard through components of waste/unused batteries of solar equipments.		
SOCIAL MOBILIZATION / FORMATION OF COMMUNITY GROUPS			Maintenance of records for: • How many people of WWMC (including Women, SC, ST, transhumant and other vulnerable/ marginalized sections) attended the meeting. • Number of beneficiaries (including Women, SC, ST, transhumant and other vulnerable / marginalized sections) • Whether every member of the beneficiary group is participating or not? • Increase/decrease in labour demand.

Annexure IV-Figure 1: Application of ESMF on Planning and Implementation



Annexure-V Transhumant Action Plan

Transhumant population

Annexure V- PEST AND NUTRIENT MANAGEMENT GUIDELINES

1- LIST OF PESTICIDES WHICH ARE BANNED, REFUSED REGISTRATION AND RESTRICTED IN USE[13]

(Updated on 31.03.2024)

1.1 PESTICIDES / FORMULATIONS BANNED IN INDIA

A.	**Pesticides Banned for manufacture, import and use.**	
	1.	Alachlor (S.O. 3951 (E), dated 08.08.2018)
	2.	Aldicarb (S.O. 682 (E) dated 17th July 2001)
	3.	Aldrin
	4.	Benzene Hexachloride
	5.	Benomyl (S.O 3951(E) dated 8th August, 2018)
	6.	Calcium Cyanide
	7.	Carbaryl (S.O 3951(E) dated 8th August, 2018)
	8.	Chlorbenzilate (S.O. 682 (E) dated 17th July 2001)
	9.	Chlordane
	10.	Chlorofenvinphos
	11.	Copper Acetoarsenite
	12.	Diazinon (S.O 3951(E) dated 8th August, 2018)
	13.	Dibromochloropropane (DBCP) (S.O. 569 (E) dated 25th July 1989)
	14.	Dichlorovos (S.O. 3951 (E), dated 08.08.2018)
	15.	Dicofol (S.O. 4294(E) dated 3rd October, 2023)
	16.	Dieldrin (S.O. 682 (E) dated 17th July 2001)
	17.	Dinocap (S.O. 4294(E) dated 3rd October, 2023)
	18.	Endosulfron (ad-Interim order of the Supreme Court of India in the Writ Petition (Civil) No. 213 of 2011 dated 13th May, 2011 and finally disposed of dated 10th January, 2017)
	19.	Endrin
	20.	Ethyl Mercury Chloride
	21.	Ethyl Parathion
	22.	Ethylene Dibromide (EDB) (S.O. 682 (E) dated 17th July 2001)
	23.	Fenarimol (S.O 3951(E) dated 8th August, 2018)
	24.	Fenthion (S.O 3951(E) dated 8th August, 2018)
	25.	Heptachlor
	26.	Lindane (Gamma-HCH)

[13] Directorate of Plant Protection, Quarantine & Storage, Department of Agriculture & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Govt of India.

	27.	Linuron (S.O 3951(E) dated 8th August, 2018)
	28.	Maleic Hydrazide (S.O. 682 (E) dated 17th July 2001)
	29.	Menazon
	30.	Methomyl (S.O. 4294(E) dated 3rd October, 2023)
	31.	Methoxy Ethyl Mercury Chloride (S.O 3951(E) dated 8th August, 2018)
	32.	Methyl Parathion (S.O 3951(E) dated 8th August, 2018)
	33.	Metoxuron
	34.	Nitrofen
	35.	Paraquat Dimethyl Sulphate
	36.	Pentachloro Nitrobenzene (PCNB) (S.O. 569 (E) dated 25th July 1989)
	37.	Pentachlorophenol
	38.	Phenyl Mercury Acetate
	39.	Phorate (S.O. 3951 (E), dated 08.08.2018)
	40.	Phosphamidon (S.O. 3951 (E), dated 08.08.2018)
	41.	Sodium Cyanide (banned for Insecticidal purpose only S.O 3951(E) dated 8th August, 2018)*
	42.	Sodium Methane Arsonate
	43.	Tetradifon
	44.	Thiometon (S.O 3951(E) dated 8th August, 2018)
	45.	Toxaphene(Camphechlor) (S.O. 569 (E) dated 25th July 1989)
	46.	Triazophos (S.O. 3951 (E), dated 08.08.2018)
	47.	Tridemorph (S.O 3951(E) dated 8th August, 2018)
	48.	Trichloro acetic acid (TCA) (S.O. 682 (E) dated 17th July 2001)
	49.	Trichlorfon (S.O. 3951 (E), dated 08.08.2018)
B.	**Pesticide / Pesticide formulations banned for use but continued to manufacture for export**	
	1.	Captafol 80% Powder (S.O. 679 (E) dated 17th July 2001)
	2.	Dichlorvos (S.O. 1196 (E) dated 20th March 2020)
	3.	Nicotin Sulfate (S.O. 325 (E) dated 11th May 1992)
	4.	Phorate (S.O. 1196 (E) dated 20th March 2020)
	5.	Triazophos (S.O. 1196 (E) dated 20th March 2020)
C.	**Pesticides Withdrawn (Withdrawal may become inoperative as soon as required complete data as per the guidelines is generated and submitted by the Pesticides Industry to the Government and accepted by the Registration Committee. (S.O 915(E) dated 15th Jun,2006)**	
	1.	Dalapon
	2.	Ferbam
	3.	Formothion
	4.	Nickel Chloride
	5.	Paradichlorobenzene (PDCB)
	6.	Simazine

	7.	Sirmate (S.O. 2485 (E) dated 24th September 2014)
	8.	Warfarin (S.O. 915 (E) dated 15th June 2006)

* Regulation to be continued in the extant manner for non-insecticidal uses.

1.2 PESTICIDES REFUSED REGISTRATION

S. No.	Name of Pesticides
1.	2,4, 5-T
2.	Ammonium Sulphamate
3.	Azinphos Ethyl
4.	Azinphos Methyl
5.	Binapacryl
6.	Calcium Arsenate
7.	Carbophenothion
8.	Chinomethionate (Morestan)
9.	Dicrotophos
10.	EPN
11.	Fentin Acetate
12.	Fentin Hydroxide
13.	Lead Arsenate
14.	Leptophos (Phosvel)
15.	Mephosfolan
16.	Mevinphos (Phosdrin)
17.	Thiodemeton / Disulfoton
18.	Vamidothion

1.3 PESTICIDES RESTRICTED FOR USE IN THE COUNTRY

S. No.	Name of Pesticides	Details of Restrictions
1.	Aluminium Phosphide	The Pest Control Operations with Aluminium Phosphide may be undertaken only by Govt. /Govt. undertakings / Govt. Organizations / pest control operators under the strict supervision of Govt. Experts or experts whose expertise is approved by the Plant Protection Advisor to Govt. of India except 1Aluminium Phosphide 15 % 12 g tablet and [2]Aluminum Phosphide 6 % tablet. [RC decision circular F No. 14-11(2)-CIR-II (Vol. II) dated 21- 09-1984 and G.S.R. 371(E) dated 20th may 1999]. [1]Decision of 282nd RC held on 02-11-2007 and, [2]Decision of 326th RC held on 15-02-2012. The production, marketing and use of Aluminium Phosphide tube packs with a capacity of 10 and 20 tablets of 3 g each of Aluminium Phosphide are banned completely. (S.O.677 (E) dated 17th July, 2001)
2.	Captafol	The use of Captafol as foliar spray is banned. Captafol shall be used only as seed dresser. (S.O.569 (E) dated 25thJuly, 1989) The manufacture of Captafol 80 % powder for dry seed treatment (DS) is banned for use in the country except manufacture for export. (S.O.679 (E) dated 17thJuly, 2001)
3.	Carbofuran	All other formulations of Carbofuran except Carbofuran three percent Encapsulated granule (CG) along with the crop labels may be stopped from use (S.O. 4294(E) dated 3rd October, 2023)
4.	Chlorpyriphos	Chlorpyriphos is banned for use in Ber, Citrus and Tobacco. (S.O. 4294(E) dated 3rd October, 2023)
5.	Cypermethrin	Cypermethrin 3% Smoke Generator is to be used only through Pest Control Operators and not allowed to be used by the General Public. [Order of Hon,ble High Court of Delhi in WP(C) 10052 of 2009 dated 1407- 2009 and LPA-429/2009 dated 08-09-2009]
6.	Dazomet	The use of Dazomet is not permitted on Tea. (S.O.3006 (E) dated 31st Dec, 2008)

S. No.	Name of Pesticides	Details of Restrictions
7.	Dicohlro Diphenyl Trichloroethane (DDT)	The use of DDT for the domestic Public Health Programme is restricted up to 10,000 Metric Tonnes per annum, except in case of any major outbreak of epidemic. M/s Hindustan Insecticides Ltd., the sole manufacturer of DDT in the country may manufacture DDT for export to other countries for use in vector control for public health purpose. The export of DDT to Parties and State Non- Parties shall be strictly in accordance with the paragraph 2(b) article 3 of the Stockholm Convention on Persistent Organic Pollutants (POPs). (S.O.295 (E) dated 8th March, 2006) Use of DDT in Agriculture is withdrawn. In very special circumstances warranting the use of DDT for plant protection work, the state or central Govt. may purchase it directly from M/s Hindustan Insecticides Ltd. to be used under expert Governmental supervision. (S.O.378 (E) dated 26th May, 1989)
8.	Dimethoate	Dimethoate is banned for use in fruits and vegetables that are consumed as raw food items. (S.O. 4294(E) dated 3rd October, 2023)
9.	Fenitrothion	The use of Fenitrothion is banned in Agriculture except for locust control in scheduled desert area and public health. (S.O.706 (E) dated 03rd May, 2007)
10.	Malathion	Malathion is banned for use on Sorghum, Pea, Soybean, Castor, Sunflower, Bhindi, Brinjal, Cauliflower, Radish, Turnip, Tomato, Apple, Mango and Grape. (S.O. 4294(E) dated 3rd October, 2023)
11.	Mancozeb	Mancozeb is banned for use on Guava, Jowar and Tapioca. (S.O. 4294(E) dated 3rd October, 2023)
12.	Methyl Bromide	Methyl Bromide may be used only by Govt. /Govt. undertakings/Govt. Organizations / Pest control operators under the strict supervision of Govt. Experts or Experts whose expertise is approved by the Plant Protection Advisor. [G.S.R.371 (E) dated 20th May, 1999 and earlier RC decision]

S. No.	Name of Pesticides	Details of Restrictions
13.	Monocrotophos	Monocrotophos is banned for use on vegetables. (S.O.1482 (E) dated 10th Oct, 2005) 1) The use of Monocrotophos 36% SL formulation is to be discontinued and no new certificate of registration for its manufacture shall be issued after publication of S.O. 4294(E) dated 3rd October, 2023. 2) With an objective of providing alternatives of this formulation so that the farmers do not suffer losses due to non-availability of effective control against certain insect pests in specific crops, the label claims for other formulations of Monocrotophos may be extended in one-year period from the date of publication of S.O. 4294(E) dated 3rd October, 2023. 3) After this period, all the certificates of registration of Monocrotophos 36% SL will stand cancelled. Sale, distribution or use of Monocrotophos 36% SL shall be allowed only for clearance of existing stock till its expiry period. (S.O. 4294(E) dated 3rd October, 2023)
14.	Oxyfluorfen	Oxyfluorfen is banned for use on Potato and Groundnut. (S.O. 4294(E) dated 3rd October, 2023)
15.	Quinalphos	Quinalphos is banned for use on Jute, Cardamom and Sorghum. (S.O. 4294(E) dated 3rd October, 2023)
16.	Trifluralin	i. The Registration, import, manufacture, formulation, transport, sell and its all uses except use in wheat shall be prohibited and completely banned from 8th August, 2018. ii. A cautionary statement has to be incorporated in the label and leaflet that it is toxic to aquatic organism, hence should not be used near water bodies, aquaculture or pisciculture area. (S.O 3951(E) dated 8th August, 2018)

2-List of permissible pesticides

Slightly hazardous (Class III) technical grade active ingredients in pesticides under IPM.

Acetochlor [ISO]	Dimethametryn [ISO]	*Lufenuron [ISO]*
Alloxydim	Dimethirimol	Malathion [ISO]
Ametoctradin [ISO]*	Dimethomorph [ISO]	*Mandestrobin [ISO*]*
Ammonium sulfamate	Dinitramine [ISO]	*Meptyldinocap [ISO]*
Ancymidol [ISO]	*Dinotefuran [ISO]*	*Mesotrione [ISO]*
Anilazine [ISO]	Diuron [ISO]	Metazachlor
Asulam [ISO]	Dodemorph [ISO]	Methabenzthiazuron [ISO]
Atrazine [ISO]	Empenthrin [(1R) isomers] [ISO]	Methyldymron
Bacillus thuringiensis (Bt)	Esprocarb [ISO]	Metobromuron [ISO]
Benalaxyl [ISO]	Ethephon	*Metofluthrin [ISO]*
Benazolin [ISO]	*Etoxazole [ISO]*	Metolachlor [ISO]
Benfuresate	Etridiazole [ISO]	Metoxuron
Biphenyl	*Fenamidone [ISO]*	*Monalide [ISO]*
Bispyribac	Fenarimol [ISO]	Monolinuron
Borax [ISO]	Fenbuconazole	1-Naphthylacetic acid
Bupirimate [ISO]	Fenbutatin oxide [ISO]	*Nitrofen [ISO]*
Buprofezin [ISO]	*Fenoxaprop-ethyl [ISO]*	N-octylbicycloheptene dicarboximide [C]
Butachlor	*Fenoxaprop-p-ethyl [(ISO)]*	Ofurace
Butylate [ISO]	*Fenpicoxamid [ISO*]*	Oxycarboxin [ISO]
Carboxin [ISO]	Fenpropimorph	Penconazole
Chinomethionat [ISO]	*Fenpyrazamine [ISO*]*	*Penthiopyrad [ISO]*
Chloridazon [ISO]	Flamprop-M	2-Phenylphenol [C]
Chlorimuron	*Flazasulfuron [ISO]*	*Picoxystrobin [ISO]*
Chloroxuron [ISO]	Fluazifop-p-butyl [ISO]	Pimaricin
Chlorpyrifos methyl [ISO]	*Flubendiamide [ISO]*	*Pinoxaden [ISO]*
Chlorthal-dimethyl	*Flubenzimine [ISO]*	Probenazole
Chlozolinate	Flufenoxuron	Prometon [ISO]
Cinmethylin	*Flumioxazin [ISO]*	Prometryn [ISO]
Clofentezine [ISO]	*Fluopyram [ISO]*	Propargite [ISO]
Clopyralid [ISO]	Flurochloridone	*Pymetrozine [ISO]*
Cyclaniliprole	*Flutianil [ISO*]*	Pyridate [ISO]
Cycloate [ISO]	tau-Fluvalinate	Pyrifenox [ISO]
Cycloxydim	*Fluxapyroxad [ISO*]*	Pyrimethanil [ISO]
Cyflumetofen [ISO]	Fosamine [ISO]	*Pyriofenone [ISO*]*
Cyromazine	Glyphosate [ISO]	Pyrithiobac sodium [ISO]
Diafenthiuron [ISO]	Halofenozide	*Pyroxsulam [ISO]*
Dichlobenil [ISO]	Hexaconazole	Quinclorac
Dichlormid	Hymexazol	Resmethrin [ISO]
Dicloran	*Imazamox [ISO]*	*Saflufenacil [ISO]*
Dienochlor	*Imazapic [ISO]*	Sethoxydim [ISO]
Diethyltoluamide [ISO]	Iprodione [ISO]	Spinosad [ISO]
Diflubenzuron	Isoxaflutole [ISO]	*Spirodiclofen [ISO]*
Diflufenican [ISO]	Kresoxim-methyl [ISO]	Spirotetramat [ISO]
Dimefuron [ISO]	Linuron [ISO]	Sulphur

TCA (sodium salt) [ISO]	Thiabendazole [ISO]	*Trinexapac-ethyl [ISO]*
Temephos [ISO]	Thidiazuron	Triticonazole [ISO]
Terbuthylazine [ISO]	Tri-allate [ISO]	Undecan-2-one [C]
Terbutryn [ISO]	Trietazine [ISO]	
Tetrachlorvinphos [ISO]	*Triflumezopyrim [ISO*]*	

EHC = Environmental Health Criteria Monograph; HSG = Health and Safety Guide; IARC = IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; ICSC = International Chemical Safety Card; JECFA = Evaluation by the Joint FAO/WHO Expert Committee on Food Additives; JMPR = Evaluation by the Joint FAO/WHO Meeting on Pesticide Residues; JMPS = Evaluation by the Joint FAO/WHO Meeting on Pesticide Specifications.

Notes to Class III

1. *No WHO evaluations are available, but detailed evaluations of classification are available from stringent regulatory authorities.*
2. *JMPR concluded that isoxaflutole is carcinogenic in mice and rats, but unlikely to pose a carcinogenic risk to humans from the diet (JMPR 2013).*
3. Malathion: LD_{50} value can vary according to impurities. This value has been adopted for classification purposes and is that of a technical product conforming to WHO specifications.
4. Pimaricin: antibiotic, identical with tennecetin and natamycin.
5. Resmethrin is a mixture of isomers, the trans isomer (70-80%) also being known as bioresmethrin and the cis isomer (20-30%) as cismethrin. Bioresmethrin alone is of much lower toxicity (oral LD_{50} >7000 mg/kg) and appears in Table 5.
6. *JMPR concluded that spirodiclofen is carcinogenic in mice and rats, but unlikely to pose a carcinogenic risk to humans from the diet (JMPR 2009). The European Union Committee for Risk Assessment (RAC) concluded that spirodiclofen should be classified as Category 1B for Carcinogenicity (H350) according to the GHS (ECHA 2016b).*
7. Sulphur dust can spontaneously ignite unless diluted about 50% with inert material.
8. TCA: The data shown refer to sodium trichloroacetic acid. In many countries, the same term (TCA) refers to the free acid (now accepted by ISO): this is a solid with an oral LD_{50} of 400 mg/ kg bw and if used as a pesticide would be placed in Class II. It is highly corrosive to skin.

3: Details on IPNM, IWM and IPDM Approaches

	Integrated Plant Nutrient Management (IPNM)	Integrated Weed Management	Integrated Pest & disease Management
About the component	Integrated nutrient management is a system / an approach; where in the overall nutrient requirement of a crop is assessed / estimated on the basis of soil test crop response (STCR), accordingly the nutrients are supplied in an integrated manner (combination of organic, inorganic, biofertilizers, green manures, and micro nutrients.	Weeds are integral part of cropping system. Weeds are naturally selected and have the ability to survive under adverse condition. No-single method in the past has proved effective against weeds. IWM is a combination of mechanical, cultural, manual, biological and chemical method of weed control.	IPDM is a management tool for pests and disease management, where in mechanical, cultural, biological, chemical, use of resistant varieties, and quarantine methods are carefully combined to keep pest & diseases at below economic injure levels to obtain optimum crop yields.
Requirement of component	Assessment practices under IPNM helps farmers to know the exact nutritional requirement for a given crop. If proper IPNM practices are not followed there will be more possibilities of imbalance in the application of nutrients, as a result excess or deficit in the availability of nutrients reduces the plant's ability to utilize nutrients from the soil. It will also leads to improper metabolism of nutrients. This may result in the reduction of immunity of the plants, which may attract pests and diseases, resulting in poor yields. Additionally, excessive or unaccounted input application leads to increase the production costs.	Potential yields of any crop can be obtained only when the weeds are properly managed. Weeds compete for moisture, nutrients, space and they acts as hosts for many pests and disease. Therefore IWM is imperative.	IPDM is Eco & farmer friendly. Environmentally safe. Cost effective. If reduces the application of pesticides. Results are assured.
Where can it be practiced	IPNM is invariably practiced for cultivation of all crops in all soil types including the degraded shallow, soils resulting in poor crop yields.	IPNM the source of weeds are innumerable, for example weed can spread through FYM, soil, wind, water along with crop seeds and by birds. Therefore to manage the weeds we	IPDM will be practiced in nurseries and main field, pre sowings to post harvesting storehouses. Example: - Granaries, exports of planting and seed materials.

		must select well-decomposed weed seed free compost. Before sowing, after sowing, during crop period and after harvesting, weeds shall be controlled. Only certified seeds / planting materials, seeds shall be used.	
When can it be practiced	IPNM has to be planned on scientific basis, from the first day of land preparation, sowing to harvesting	Right from preparation of land i.e. pre-sowing, sowing, selection of seed and application of FYM, during the crop stage, at the time of harvest, after harvest, after harvest, during the time of threshing, processing and packing.	IPDM will be practiced from seed to seed, which includes pre- sowings to post harvesting of the crop.
Who can adopt the practice	It is joint responsibility of project staff and other project stakeholders i.e. WWMC, RVC, FIG members/farmers.	Extension staff, quarantine officers and farmers.	Farmers, extension workers, scientists, traders, quarantine officers, etc.
How is the practice adopted	By sensitizing area groups, creating awareness to farmers through publicity propaganda, organizing communities and training's. Demonstrations can be conducted on the lines of farmers field school (FFS). Application of nutrients based on STCR results. All decisions are taken by farmers in the fields with the help of extension staff, during the period of demonstration from pre sowing to post harvest (seed-to seed). Farmers can actively be involved in the field and they record all the observations and maintain the records during demonstration period.	Creating awareness among the farmers (users groups) by publicity, propaganda, and organizing communities. IWM shall be practiced through demonstrations on the lines of FFS.	The first step involved in IPDM planning is to sensitize the facilitators i.e. extension staff and the farmers in the watershed areas. This will be done by organizing Farmers Field Schools.

4 - Pesticide Management Plan

The aspects to be considered in the screening process are:

- Selective against target pests
- Safe for beneficial species
- Active for about 4 weeks
- Weather and u/v proof
- No toxic residues
- Safe for humans and livestock

Key Aspects

Four key aspects must be kept included in implementing the pest management plan.

i. It must comply with World Bank ESS3.The basic tenets governing the Operational policy has been presented earlier.

ii. Pest control strategy must promote the use of integrated methods including biological or safer chemical control methods and reduce reliance on synthetic chemical pesticides. If there are strong factors needing the use of synthetic chemicals then they must belong to only WHO class III and minimum hazardus category. The control of pest populations should be through IPM approaches, such as biological control, cultural practices, and the development and use of crop varieties that are resistant or tolerant to the pest. This should be built through participatory technology development using farmer's experience and knowledge and furthered through the farmer field school approach. IPM is also the strategy adopted by the Govt. of UK. and its expertise is available both in the extension wing of the Agriculture Dept. and the various research, training and agriculture centers in UK.

iii. As pest management strategy could affect agriculture or public health the screening process must ensure full compliance with Bank safeguards. It must address not only the farmer but also workers involved in various pesticide operations The task of the screening process must be to ensure that UCRRFP interventions do not contravene the Bank's environmental standards . Addressing this aspect and the effectiveness in safeguarding the Bank policies on pesticide management will depend on the capacities and knowledge of those undertaking and supervising the screening process. Thus those involved in this must be selected based on clear criteria and their skills upgraded through training and capacity building along with a monitoring framework. As the project would lead to intensification of cropping pattern, the audit process must look at the cumulative impact on soil, water and air and ensure that there are no negative impacts and the mitigation measures are in place and effective.

iv. More pro-active role in promoting healthy plants and safe environment. Healthy plants will come from adopting Integrated Plant Nutrient Management (IPNM) and a safe environment by

encouraging projects that promote and advocate organic and non-pesticide farming and the products and technologies that encourage and facilitate their adoption, so that IPM will succeed in not only reducing the application of pesticides but eliminate the same without reduction in yields.

Criteria for Pesticide Selection and Use

i. The procurement of any pesticide in a Bank- financed project is contingent on an assessment of the nature and degree of associated risks, taking into account the proposed use and the intended users. with respect to the classification of pesticides and their specific formulations, in reference to the World Health Organization's Recommended Classification of Pesticides by Hazard and Guidelines to Classification. The following criteria apply to the selection and use of pesticides in,

   (a) They must have negligible adverse human health effects.

   (b) They must be shown to be effective against the target species.

   (c) They must have minimal effect on non target species and the natural environment. The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies. Pesticides used in public health programs must be demonstrated to be safe for inhabitants and domestic animals in the treated areas, as well as for personnel applying them.

   (d) Their use must take into account the need to prevent the development of resistance in pests.

ii. It is required that any pesticides be manufactured, packaged, labeled, handled, stored, disposed of, and applied according to standards acceptable to the WHO. Formulated products that fall in WHO classes IA and IB, or formulations of products in Class II, if (a) lacks of restrictions on their distribution and use; or (b) they are likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store and apply these products properly are not permissible in the project. (Annexure- VII & VIII)

Awareness building

Awareness building on safe use among farmers and agriculture workers is another instrument that must be used for implementing the PMP in the project. This is an essential component in the GPS. Expert caters to the field staff and does not reach the farmers who have the highest exposure to pesticides and are compelled by poverty to work in unsafe conditions. All supports to pesticide sprayers and equipment must include making available a protective gear. Pamphlets and posters on safe use of pesticides which

deal from purchase, transport, storage, application to disposal must be provided to village organizations. In high pesticide use areas, cultural expressions like folk songs must be provided to village organizations.

A major impact of pesticide usage is on water. Reducing pesticide usage by adopting IPM/NPM and permitting only class III pesticides, while substantially reducing pesticide usage, the threat to water contamination reduction is possible. Educating the community not to spray pesticides during or just before a rain must be included in the awareness material. Monitoring the health on the people, especially workers, on a sample basis in high pesticide use area would be another task taken up by the project.

The project will provide help to resource persons and training personnel for TOT activities for IPM. It could also provide crop wise IPM materials and advice on the conduct of the GP level farmer's training.

IPM focuses on participatory technology development and not the conventional agriculture extension and advice to farmers. Therefore the project IPM personnel need to have capacities in participatory methods and enabling the farmer as well as GP's. Several agencies, govt. and non-govt. organizations have expertise in developing the IPM professional and their list is appended. Trained IPM professionals are available in the Govt. and the NGO sector. Many big corporations provide manuals for safe use of pesticides especially in mixing, dosage, application and spraying. These resources will be used for undertaking TOT in IPM. As IPM is not optimal in its effectiveness we need the TOT must include Integrated Nutrient Management (INM) in the syllabus.

The division level project authority could identify specific crops and ways to reduce pest incidence and increase the effectiveness of the control measures. Holding crop specific workshops to tackle high incidence and high resistant pests involving the department of agriculture, scientists and NGO's will help come up with specific measures that would be taken to reduce the overall use of pesticides and enhance its effectiveness.

Promoting Non-Pesticidal Management (NPM) for controlling pests is the only long term way to reduce farmer dependence on pesticides. The project works with the POP which cannot afford these costly inputs. By reducing the share of pesticides in the input costs, which are high, will serve the basic objective of the project. Further once the landscape is used to pesticides, reversing it is difficult and takes a very long time. Therefore a more rational and sustainable approach would be to encourage NPM in crops, especially those grown in dry land conditions. Hence training in NPM must be also being built into IPM capacity building. A proactive approach recommending crop wise NPM approach must be promoted in the GPS & Farmers. Exposure visits of farmers to NPM practice's is a useful way of strengthening the farmers & village organizations.

IPM Options

IPM involves a range of methods to control pests (a) reactive options such as—physical and mechanical methods, biological and chemical control. A sudden withdrawal of pesticides will invariably bring down the yields drastically which the farmer will ill afford. IPM recommends a gradual withdrawal of pesticides allowing time for both the plants (and the farmers) to adjust and build up internal strength, reserves and resilience. However the long term goal should be to promote (b) proactive options to grow perfectly good crops without the help of chemical pesticides. Crop rotations and creation of habitat for beneficial organisms permanently lower the carrying capacity of the farm for the pest. Cultural controls are also considered as proactive strategies, which includes maintaining healthy, biologically active soil (increasing below ground diversity), maintaining habitat for beneficial organisms (increasing above ground diversity) and using appropriate plant cultivars. Some of the ways that will be used to maintain biodiversity of the farm would include, increasing genetic diversity, species diversity, crop rotations, multiple cropping, inter cropping, use of disease free seed and planting material, use of resistant varieties, sanitation, plant spacing, altered planting dates, optimum growing conditions, use of mulch material, etc.

- Physical and mechanical methods are the oldest form of pest control involving devises to trap and kill pests-traps, insect screens, nets, baits, and plant guards.
- Biological control methods involve the use of parasites, predators, pathogens to control pests. In natural biological control the first step would be to assess populations of beneficial organisms and their interaction within the ecosystem. If provided with adequate habitat these organisms will make significant contribution to pest management. Habitat enhancement for beneficial insects, for example, focuses on the establishment of flowering annuals and perennials that provide nectar and pollens during certain parts of life cycle of insect. Habitat and food for beneficial insects and other beneficial should be a component of the IPM programme.
- Natural methods include use of bio-sprays, some physical components of the environment, such as temperature, humidity or light, detrimental to pests are exploited through tillage operations, soil solarization, plastic mulching, etc. The effectiveness of both proactive and active management approaches would depend on correct identification of pests.
- **Use of chemicals remain the last resort in the IPM programme and may be used only when other measures, such as biological or cultural controls, have failed to keep pest populations from approaching economically damaging levels. If they must be used, they should be least toxic and should not harm the non-target organisms. As per the ESS3, pesticides from only permissible classes from WHO classification are to be used (Class III and U onward)**

- Chemical control includes the synthetic pesticides widely in use today. Most of them work by absorption (contact poisons) or ingestion (stomach Poisons). Longer lasting pesticides are described as residual.

IPM is a holistic system that reduces damage caused by pests to tolerable levels through a mixture of all the above techniques. IPM does not recommend the use of chemical control except as a last resort and even then only the least toxic chemical is used.

Operational Aspects of IPM

- Growing a healthy crop involves the right varietals selection; appropriate seed bed management, plant nutrition, and plant nutrition, and plant physiology, water and weed management.
- Optimize natural enemies recognize beneficial insects in the field, learning insect population dynamics, life cycles, and food webs; understanding the effects of pesticides on beneficial populations, promoting survivorship of predators through habitat management and making local reference collections.
- Observe fields weekly for damage symptoms, changes in insect populations, to evaluate plant growth and physiology, relationship between plant stages and insect populations, effects of weather conditions, and water and nutrient management.
- Farmers as experts: agro-system analysis and decision making based on information directly observed and collected leads to farmers to make sound conclusions crop management decisions.

Pesticide Management in water

Drift of pesticides must be avoided when spraying. They should not be applied when rain is imminent and the users should follow the direction given in the container for pesticide handling safety precautions, application rates and proper disposal. To reduce contamination of surface water and ground water from pesticides:

Evaluate the pest problems, previous pest control measures, and cropping history;

Use integrated pest management (IPM) strategies that:

a. Apply pesticides only when an economic benefit to the producer will be achieved
b. Apply pesticides efficiently and at times when runoff losses are unlikely

c. When pesticide applications are necessary and a choice of registered materials exists, consider the persistence, toxicity, runoff potential, and leaching potential of products in making a selection

d. No use of pesticide belonging to category 1 &2 as classified in the pesticide code

The goal of this management measure is to reduce contamination of surface water and ground water from pesticides. The basic concept of the pesticide management measure is to foster effective and safe use of pesticides without causing degradation to the environment. Pesticide Management Plans (PMP's) identify;

- Identify areas vulnerable to pesticides;
- Monitor source water for pesticide contamination;
- Prevent pesticides from reaching ground water;
- Respond to pesticide detection.

IPM Module for Main Crops

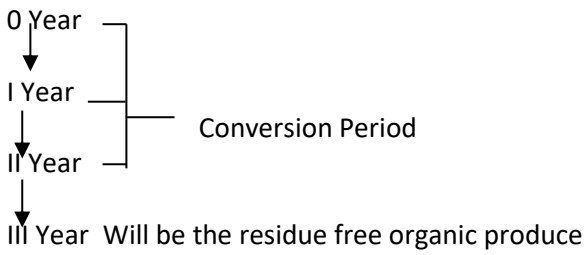
- Although the bio-pesticides and bio-agents are provided for the control of various pests, however, some of them are not effectively checked. To control these, some of the safe pesticides are recommended wherever necessary.
  - To minimize the infestation of insect, disease, weeds, etc. in practice:
  - Summer ploughing.
  - Avoid mono cropping: Use of bio-fertilizers and bio-pesticides.
  - Insect/disease resistant varieties.
  - Use of trap crops to minimize the insect damage.
  - Solarisation of nursery beds to minimize the disease incidence in seedlings.

Pesticide Residues

- Uses of pesticides in upper and mid hills region are almost negligible except in some fruits and off-season vegetables.
- To monitor the pesticide residues in the cereals, pulses, oil seeds, vegetables and fruit crops establishment of a residue analysis laboratory is essential in the state of Uttarakhand under the

supervision of GB Pant University of Agriculture & Technology Pantnagar. Till that time residue will be tested in IIT Roorkee or wherever the residue testing facility is available.

- Under the Directorate of Organic Seed Certification of Uttarakhand, a certification plan for the farmers interested to grow crops organically has been started in the following form to make their land and crop produce pesticide residue free:



- Directorate of Organic Seed Certifications and Uttarakhand Organic Commodity Board, as well as Agricultural University (Hill Campus, Ranchauri and Pantnagar) has already developed a training module for farmers.
- Project staffs along with the farmers have already been sent for exposure to within and outside the state where organic farming is under practice.

.Use of Plastic

- To minimize the use of pesticides as seed treatment to reduce the incidence of disease in nurseries, use of specific plastic sheet will be recommended for soil solarization.
- Plastic sheets will also be helpful in moisture conservation as mulch.
- Use of plastic in the form of poly tunnels and poly houses under adverse climatic conditions. This will also help in growing insect and disease free seedlings, off season vegetables and flowers to improve the economy of farmers. Thus minimizing the pesticide application.

Disposal of plastic waste:

In the project area the plastic waste is proposed to be sent to be plastic recycling and processing plants available in nearby vicinity in accordance of Waste Management Guidelines of WMD (Annexure-VIII).

Areas of Competence:

1. Prevention – Indirect measures
2. Observation- Decision tools
3. Intervention – Direct measures.

Prevention – Indirect Measures

A- Location

- Selection of place away from high humidity crops.
- Away from crops being alternate host for the major pest
- Tomato from Sunflower and Gram.
- Avoid fields having soil borne disease, pests, nematode infestation, etc.

B- Crop rotation

- No mono cropping.
- Crop rotation with legumes *(Cowpea, F. Beans, Peas).*
- Crop rotation of shallow and deep rooted crops (Onion and capsicum followed by cucurbits)
- Rotation of soil building crops with exhaustive crops (Potato followed by cabbage)

C- Selection of varieties/hybrids

- Use of resistant/tolerant varieties
- Use of Area, Crop and Season specific varieties.
- Use of varieties with wider genetic base.

D- Crop husbandry and hygiene

- No crop residues in the field
- Removal of affected plant parts and burying under the ground
- Avoid use of harmful waste as manure.
- Improperly decomposed manure.
- Avoid use of untreated sewage water for irrigation

Practice proper weed management.

E- Fertilization

- Increased use of organic manure.
- Use of balanced fertilizer.
- Practice fertilizer placement (Nutrient use efficiency and avoiding run off)
- Increased use of fertilizer mixtures.
- Minimize use of urea.
- Increased use of foliar fertilizers.

F- Irrigation

- Avoid flat irrigation
- Avoid excessive irrigation.
- Practice raised bed/furrow-ridge cultivation/irrigation
- Never submerged bed/ridge tops during irrigation.
- Use more of drip/sprinkler irrigation systems.

G- Border/Trap crops

- Mustard (Cabbage, Cauliflower)
- Marigold (Tomato)

- Maize, Cowpea (Cotton)

G- Harvesting and storage

- Harvesting at marketable stage.
- Removal of affected produce in the field.
- Sorting/grading of produce.
- Proper packing and transport
- Proper curing and storage. (Onion, Garlic, Potato, Pumpkin)

Observation – Decision tools

A- Crop Monitoring:

- For appearance of insect, pest and disease proper know how will be provided to the farmers through training, exposure visit and identification, so that, the farmer will identify the beneficial insect as well as harmful insect.
- To decide the critical stage of insect, pest and disease according to economic injury level (EIL). Farmers will himself decide to use the control measures. This will also possible through training, exposure visit, and identification of insect, pest and disease.

B- Whole area management

- Co-operative management of pests/disease

Intervention – Direct measures

A- Cultural and physical control

- Summer deep plugging
- Avoid monoculture.
- Optimum plant densities
- Avoid high nitrogenous fertilization]
- Avoid excessive irrigation

B- Pheromones

- Traps
- Lure

C- Biological control

(i)- Parasites

- Trichogramma
- Chrysoperla

(ii)-Predators

- Spiders
- Coccinellids
- Jaggery (Gurh)

(iii)-Uses of Bio-pesticides

- BTs (bacteria), Beauveria (fungus), Metarrhizium (fungus), Verticillium (fungus) and Nomuraea (nematode)

- Neuclear Polyhydrosis Viruses (NPVs), Granulosis Viruses (GV),Trichoderma (fungus) and Pseudomonas (bacteria)
- Use of Botanical Pesticide (Neem, Karanj, Chillies, Garlic)

D- Chemical Control

- Only relatively ecologically safe chemical pesticides
- Change of chemicals at each spray
- Use of recommended dose of chemical

Critical time of spray.

The Approach of IPM:

The approach of IPM is to encompasses the application of pesticides to manage serious outbreaks of insect pests only on a need basis or to limit the predicted outcome infestations.

Our priorities will be in the following order:

i) Biological method.

ii) Mechanical method.

iii) Chemical method.

Priority wise various control methods of IPM has been described in the following tabular form:

Procedure	**How it will be done**	**Remarks**
Biological	Conservation of all natural enemies & bio agents of all the harmful insect & pests eg. Birds, Parasites & pathogens, As these are farmer's friend, therefore all these are to be conserved. Use of parasites • Trichogramma Chrysoperla Use of predators • Spiders • Coccinellids • Jaggery	First and Prime priority will be of biological method of IPM.
Cultural	• Avoidance of monoculture in large belts • Improved disease resistant varieties. • Summer ploughing. • Optimum plant densities. • Avoiding excessive irrigation. • Avoiding high nitrogenous fertilization. • Trap crops	-
Mechanical	• Damage/Destroy all the eggs of the insect. • Destroy any material infested by insect, pest and diseases.	Second priority
Chemical	• If the loss is beyond ETL then only we will go for chemical control, and here only safe chemicals will be used.	This will be only last and ultimate priority and only, if crop loss is beyond ETL.

Strategy for Adoption:

Participants are selected through farmer group meetings, after formation they meet once a month for 4-5 hours in the field for the whole cropping season. The IPM provides an intensive opportunity for the farmers to master the basic skills that will enable them to make informed, confident field management decisions. After IPM farmers master the basic principles to field ecology in one crop they will extend it to other crops.

Pest Management needs to be integrated with resource mapping and inter- linkages established between different watershed activities with priorities given to those activities with clear environmental benefits.

Use of Bio-pesticides

- *Bacillus thuringiensis, Beauveria, Metarhizium, Verticillium & Nomuraea.*
- Nuclear Polyhedrosis viruses (NPV) & G.V.
- *Trichoderma, Pseudomonas*

I- Use of Botanical Products:

- Neem/Karanj/Chillies/Garlic

Need Based Use Of Chemical Pesticides

- Only relatively ecologically safe chemical pesticides.

II- Storage:

- Pesticides should be stored in a separate room under lock and key and not in the living room or cattle shed where household animals, women and children are likely to come into contact with them
- They should not be stored near the naked flame; nor where the electrical wiring is bad.
- Do not eat, drink or chew or smoke tobacco in the room where pesticides are stored.

III- Transportation:

- Pesticides should not be transported along with food or animal feed, passengers or livestock.
- They should not be transported with fertilizers and seeds.

IV- Timings:

- Pesticides should be use only if the crop damage level raised up to 50-60 percent.
- Pesticide application should not be done during rain showers.
- Pesticide application should be done 30 days prior to harvesting because the absorbed chemical takes time to dissolved and it should be left within plant parts.

Annexure VI- Waste Management Guidelines for Growth Centers/Processing centers

Agriculture is the main source of income in Uttarakhand. Under UCRRFP initiatives will be taken for increases the incomes of rural inhabitants in selected watersheds through agribusiness. In order to facilitate the production of marketable produce, formation of FIGs was introduced to facilitate the production, processing and marketing of high value crops. To full fill the objectives project will established Growth Centers, Processing centers. These activities are intervened for the economic strengthen of rural inhabitants. At the same time, these activities also cause some organic and inorganic residue. According to the Environmental and Social Management Framework of the project, safe disposal of this residue is necessary. Therefore the organic and inorganic residue left over due to these active should be disposed-off /re-used as under.

Growth Centers/Processing centers:

After processing of agro produce, Organic and Inorganic both type of waste material is available in the units. These are as follows.

Organic Waste:

- Bark & Seed of the Fruit.
- Pulp of Fruit and Vegetables
- Decayed Fruit, vegetables, Pulses etc.
- Waste water

Disposal /uses

All the organic waste should be re-used as compost for agricultural purposes. To convert the organic reduce into compost, a compost pit should be construct nearby each processing unit. The waste amassed during processing should collect in a pot and brought down to the compost pit. After decomposition, this material can be use as compost.

During processing, water us used massively for washing and other purposes. Thus proper drainage system should be assured in the processing units. The used water should be collected in a sock pit through a drainage pipe. So that, the waste water can percolates and recycled.

Inorganic waste

- Plastic /Glass Bottles, Packaging material
- Plastic Cans /Caps etc.

Disposal /uses

As far as possible the plastic cans and bottles should be re-used after proper washing. The damaged and unusable canes and bottles should be sanded for recycling. It is necessary to ensure that unused plastic/glass bottles, canes packing martial, sticker etc. should not spread over here & there in any situation.

Disposal of plastics waste from poly house / poly tunnel and LDP tanks

Under normal conditions the averages shelf life of the polyethylene sheets, used for poly houses and poly tunnels is 3-5 years. The low density polyethylene sheets used for LDP tanks can be used from 5-6 years. After that period the sheet itself become unusable. At this situation, after changing the older sheet by the new one, it should be given for recycling processes. It has to insure that the older sheet or its pieces should not be spread here & there in any condition.