**Annexure 3: Input Indicators and Variables for livestock impact analysis**

| **Activity indicators** | **Season** | **Variables** | **Input data for tracking Anomalies /factors** | **Impact Observation & Monitoring** | **Data capture & transmission** | **Analyzing of high-impact weather conditions and consequences** |
| --- | --- | --- | --- | --- | --- | --- |
| Ground Pasture Conditions | All season | All types of pasture biomass/plant species of rangelands being monitored by NAMEM | Non-grazing days/non-grazing being mandated by grazing plan ( Bag/soum) | * Rangeland health monitoring technician every 10 days. * Automatic weather stations ( AWS ) to track impacting weather factors | * National Rangeland Monitoring Database ( DIMA) * Herders * Local Government volunteers * MRCS/Community volunteers | * Type of climatic factors |
| Pasture grazing calendar for the month and estimated number of grazing days | All season | Grazing Days of the Month | Non-grazing days | * Automatic weather stations in high economic activity areas * Weather observer/Crowdsource situation observation (Herders, Input supplier, Local Volunteers ) * Operational Forecast on Heatwave. | * Herders * Input supplier * Local Volunteers | * Heat waves and hot days |
| Prepare a calendar for the animals having access to drinking water( water point/surface water ) | All season | Access to drinking water | * The number of days & sources animals get access to drinking water. * Number of days & animal face difficulties in getting access to drinking water | * Representative herder group at bag/soum level to observe the conditions, record geolocation and a brief description of, and send to aimag WhatsApp group/Apps/SMS. | * Herders * Input supplier * Local Volunteers | * Locational analysis surface water access point on GIS map and buffer areas be able to access. * Locational analysis of surface water body on GIS map |
| Prepare hazard calendars *(Register/logging everyday weather-related difficulties and no of animal mortality)* | All season | Days Impacting Livestock Husbandry | * No days weather-related hazards hampered grazing, * all elements of animal husbandry | Each herder is to observe the conditions, record geolocation and a brief description of, and send to aimag WhatsApp group/Apps/SMS. | * Herders * Input supplier   Local Volunteers | Types of hi-impact weather and days hampered livestock lifecycles. |
| Prepare Drought hazard calendars | Summer  Autumn  Spring | Days Impacting Livestock Husbandry | * No days weather-related hazards hampered grazing, * all elements of animal husbandry * Impacting pasture growth * Agriculture value chain * Integrated water management * Essential Irrigation | * Automatic weather stations in high economic activity areas * Weather observer/Crowdsource situation observation (Input supplier, Local Volunteers ) * Representative herder group at bag/soum level to observe the conditions, record geolocation and a brief description of, and send to aimag WhatsApp group/Apps/SMS. * Operational Forecast on Drought |  | * Types of hi-impacts and days that hampered livestock lifecycles |
| * Heatwave/hot spell | Summer | hot days | * Everyday grazing /feeding status. * Impact over the elements of the animal husbandry value chain * loss and damage statistics | * Automatic weather stations in high economic activity areas * Weather observer/Crowdsource situation observation (Input supplier, Local Volunteers ) * Representative herder group at bag/soum level to observe the conditions, record geolocation and a brief description of, and send to aimag WhatsApp group/Apps/SMS.   Operational Forecast on drought. | * AWS * Herders * Input supplier * Local Volunteers | * Delineating impact area with GIS calculates impact threshold, L & D. |
| * Wildfire | Summer | hot days | hampered grazing and animal husbandry value chain, loss and damage | Using satellite image ( MODIS ……………..) | * AWS * Herders * Input supplier * Local Volunteers | * Plotting hotspot location on GIS map and analyze Impact Thresholds, calculate L & D. |
| * Dust Storm/Sandstrom /haze days | Summer  Autumn  Spring  Winter | Dust storm/haze hours/days | * Hampering grazing hours/days * Impacts on the Elements of the Animal Husbandry value chain * loss and damage | * Using Dust storm monitoring stations * Asian Dust Storm/haze monitoring network | * AWS * Herders * Input supplier * Local Volunteers | * Delineating impact area with GIS calculates impact threshold, L & D |
| * High wind and dry spells | Summer  Autumn  Spring | High wind and dry spells days | * Everyday grazing /feeding status. * Impact over the elements of the animal husbandry value chain * loss and damage statistics | * AWS * Crowdsource | * AWS * Herders * Input supplier * Local Volunteers | * Analyze Impact Thresholds |
| * Convective Thunderstorms & lightning | Summer  Autumn  Spring | Thunderstorm & lightning days | * Everyday grazing /feeding status. * Impact over the elements of the animal husbandry value chain * loss and damage statistics | * AWS ( Lighting receiving sensor, drone IR image/Radar sensor for convective conditions and cloud assessment, weather observer open eye observation ) * Crowdsource open-eye observation | * AWS * Herders * Input supplier * Local Volunteers | * Delineating convective location and analyzing impact with GIS. * Calculate impact threshold, L & D of livestock |
| * Heavy rainfall | Summer  Autumn  Spring | Heavy rainfall days | * Everyday grazing /feeding status. * Impact over the elements of the animal husbandry value chain * loss and damage statistics | * AWS (Lighting receiving sensor, drone IR image/Radar sensor for convective conditions and cloud assessment ) * Crowdsource open eye cloud observation, rainfall amount & timing estimation and areas receiving rainfall | * AWS * Herders * Input supplier * Local Volunteers | * Delineating convective location, Rainfall receiving areas and analyze impact with GIS. * Calculate impact threshold, L & D of livestock |
| * Flooding and Flash flooding | Summer  Autumn  Spring | Flooding and Flash flooding | * Everyday grazing /feeding status. * Impact over the elements of the animal husbandry value chain * loss and damage statistics | * AWS (Lighting receiving sensor, drone IR image/Radar sensor for convective conditions and cloud assessment ) * Crowdsource open eye cloud observation, rainfall amount & timing estimation and areas receiving rainfall | * AWS * River gauging stations * Glacier melting and river flooding level monitoring stations * Herders * Input supplier * Local Volunteers | * Delineating Flooding and Flash flooding extent areas , * Analyzing flooding /flash flooding potentials ad impact with GIS. * Calculate impact threshold, L & D of livestock |
| * Animal zoonotic diseases | Summer  Autumn  Spring | Types of diseases | Number/types of animals infected /killed   * Impact over the elements of the animal husbandry value chain * loss and damage statistics | * Analyze weather factors contributed (?). * Herders, Input suppliers, and Local Volunteers to track-record areas( geolocation) and the number of animals are infected * Operational forecasts about the impending zoonotic diseases/outbreaks Households in Foot-and-Mouth disease-free areas | * AWS * Herders * Input supplier * Local Volunteers | * Analyze geolocations of outbreak areas and develop a GIS alert map and briefing of the outbreaks. * Linking weather factors can potentially cause the outbreak |
| * Others hazards | Summer  Autumn  Spring | Minutes/ hours/Days | * Everyday grazing /feeding status. * Impact over the elements of the animal husbandry value chain * loss and damage statistics | - | * AWS * Herders * Input supplier * Local Volunteers | * Analyze Impact Thresholds with GIS map |
| **Tracking hi-impact weather conditions in autumn** | **Autumn** |  |  |  |  |  |
| Cold front | Autumn | Cold front hours/days | * Everyday grazing /feeding status. * Impact over the elements of the animal husbandry value chain * loss and damage statistics | Dynamic downscaling over the prevailing cold front conditions with spatiotemporal scale and preparing operational forecasts | * AWS * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Sudden onset Strong wind (gust, wind shear) | Autumn | Strong wind hours/Days | * Everyday grazing /feeding status. * Impact over the elements of the animal husbandry value chain * loss and damage statistics | Dynamic downscaling over the prevailing conditions with spatiotemporal scale model output and preparing operational forecasts | * AWS * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Sudden onset Cold /Lower/lowest temperature ( diurnal) | Autumn | No of hours/ days | * What level hampering grazing /feeding * Impact over the elements of the animal husbandry value chain * loss and damage statistics | Dynamic downscaling over the prevailing conditions with spatiotemporal scale model output and preparing operational forecasts | * AWS * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Sudden onset snowing, sleet ( diurnal) | Autumn | Snow, sleet Minutes/ hours/Days | * What level hampering grazing /feeding * Impact over the elements of the animal husbandry value chain   loss and damage statistics | Dynamic downscaling over the prevailing conditions with spatiotemporal scale model output and preparing operational forecasts | * AWS * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Sudden onset cold rain | Autumn | Cold rain Minutes/ hours/Days | Impact over the elements of the animal husbandry value chain | Dynamic downscaling over the prevailing conditions with spatiotemporal scale model output and preparing operational forecasts | * AWS * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Convective Thunderstorms & lightning | Autumn | Cold rain Minutes/ hours/Days | * What level hampering grazing /feeding * Impact over the elements of the animal husbandry value chain * loss and damage statistics | * AWS ( Lighting receiving sensor, drone IR image/Radar sensor for convective conditions and cloud assessment, weather observer open eye observation )   Crowdsource open-eye observation | * AWS * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Dust Storm/Sandstrom /haze days | Autumn | Minutes/ hours/Days | * What level hampering grazing /feeding * Impact over the elements of the animal husbandry value chain * loss and damage statistics | * AWS ( Lighting receiving sensor, drone IR image/Radar sensor for convective conditions and cloud assessment, weather observer open eye observation )   Crowdsource open-eye observation | * AWS * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Other hazards of the autumn | Autumn | Minutes/ hours/Days | * What level hampering grazing /feeding * Impact over the elements of the animal husbandry value chain * loss and damage statistics |  | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| **Tracking hi-impact Weather conditions in Winter** | **Winter** |  |  |  |  |  |
| Extreme cold temperature | Winter | Minutes/ hours/Days | * Acquisition of temperate data * Inventorying days of animal husbandry value chain disrupted by extreme conditions * loss and damage statistics | Observation of weather conditions with AWS, weather observations stations, weather observers, herders, volunteers | * AWS * Weather Post * Herders * Input supplier * Local Volunteers | Analyze Impact Thresholds with GIS map |
| Snowing , sleet | Winter | Minutes/ hours/Days | * What level hampering grazing /feeding * Impact over the elements of the | Observation of weather conditions with AWS, weather observations stations, weather observers, Crowdsource, volunteers | * AWS * Weather Post * Herders * Input supplier * Local Volunteers | Analyze Impact Thresholds with GIS map |
| Snowstorm | Winter | Minutes/ hours/Days | * What level hampering grazing /feeding * Impact over the elements of the animal husbandry value chain   loss and damage statistics | Observation of weather conditions with AWS, weather observations stations, weather observers, Crowdsource, volunteers | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Extreme cold temperature | Winter | Minutes/ hours/Days | * What level hampering grazing /feeding * Impact over the elements of the animal husbandry value chain * loss and damage statistics | Observation of weather conditions with AWS, weather observations stations, weather observers, Crowdsource, volunteers | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Strong wind ( speed) | Winter | Minutes/ hours/Days | * What level hampering grazing /feeding * Impact over the elements of the animal husbandry value chain * loss and damage statistics | Observation of weather conditions with AWS, weather observations stations, weather observers, Crowdsource, volunteers | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Avalanche | Winter | Minutes/ hours/Days | * What level hampering grazing /feeding * Impact over the elements of the animal husbandry value chain   loss and damage statistics | Analyze ground observation data with geolocation | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Precipitation of snow | Winter | Minutes/ hours/Days | * What level hampering grazing /feeding * Impact over the elements of the animal husbandry value chain   loss and damage statistics | Observation of weather conditions with AWS, weather observations stations, weather observers, Crowdsource, volunteers | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Thickness of snow | Winter | Minutes/ hours/Days | * What level hampering grazing /feeding * Impact over the elements of the animal husbandry value chain   loss and damage statistics | Observation of weather conditions with AWS, weather observations stations, weather observers, Crowdsource, volunteers | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Blizzard | Winter | Minutes/ hours/Days | * What level hampering grazing /feeding * Impact over the elements of the animal husbandry value chain * loss and damage statistics | Observation of weather conditions with AWS, weather observations stations, weather observers, Crowdsource, volunteers | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Frozen River | Winter | Minutes/ hours/Days | What level of hampering communication | hydro met monitor, Local technician, | River gauzing station | Analyze Impact Thresholds with GIS map |
| Frozen Lake | Winter | Minutes/ hours/Days | Disruption of physical communication | hydro met monitor, Local technician, | River gauzing station | Analyze Impact Thresholds with GIS map |
| **Tracking hi-impact weather conditions in the Spring season** | **Spring** |  |  |  |  |  |
| The cold front and warm front | Spring | Minutes/ hours/Days | Disruption of physical communication | hydro met monitor, Local technician, | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Snowstorm | Spring | Minutes/ hours/Days | What level hampering grazing /feeding | Observation of weather conditions with AWS, weather observations stations, weather observers, Crowdsource, volunteers | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Extreme cold temperature | Spring | Minutes/ hours/Days | Impact over the elements of the animal husbandry value chain | Observation of weather conditions with AWS, weather observations stations, weather observers, Crowdsource, volunteers | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| A strong wind ( speed) | Spring | Minutes/ hours/Days | loss and damage statistics | Observation of weather conditions with AWS, weather observations stations, weather observers, Crowdsource, volunteers | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Avalanche | Spring | Minutes/ hours/Days | What level hampering grazing /feeding | Observation of weather conditions with AWS, weather observations stations, weather observers, Crowdsource, volunteers | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Precipitation of snow | Spring | Minutes/ hours/Days | Impact over the elements of the animal husbandry value chain | Observation of weather conditions with AWS, weather observations stations, weather observers, Crowdsource, volunteers | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |
| Density and thickness of snow | Spring | Minutes/ hours/Days | loss and damage statistics | Observation of weather conditions with AWS, weather observations stations, weather observers, Crowdsource, volunteers | * AWS * Weather Post * Herders * Input supplier   Local Volunteers | Analyze Impact Thresholds with GIS map |