**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 | SummerAutumnSpring  | 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
 | SummerAutumnSpring 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
 | SummerAutumnSpring  | 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
 | SummerAutumnSpring  | 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
 | SummerAutumnSpring  | 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
 | SummerAutumnSpring  | 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
 | SummerAutumnSpring  | 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
 | SummerAutumnSpring  | 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  |