



REPORT

**Working Group on  
Production Environment  
Descriptors for Farm Animal  
Genetic Resources**

Report of a Working Group

19 – 21 January 1998

Armidale, Australia

Rome, 1998



**FOOD AND AGRICULTURE ORGANIZATION  
OF THE UNITED NATIONS**

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**Production Environment Descriptors for Farm Animal Genetic Resources**  
**Report of a Working Group,**  
**Armidale, Australia, 19 - 21 January 1998**

**I. Introduction**

A meeting of experts was convened in Armidale, Australia to develop a set of criteria and indicators that can be used to characterize diverse livestock production environments in order to better understand the comparative adaptive fitness of different breeds of the farm animal species. The meeting was conducted to initiate the development of the necessary guidelines for action planning and of the descriptors required for inclusion in an expanded Breeds Database in Stage 2 of the Domestic Animal Diversity Information System (DAD-IS) as requested by countries. This work also supports the further development of the Global Strategy for the Management of Farm Animal Genetic Resources.

The Global Strategy is now being detailed by FAO for country use in characterizing, i.e. surveying, monitoring and describing at various genetic levels; using and developing, maintaining, and accessing domestic animal diversity to realize the sustainable intensification of animal production for addressing human-kinds range of increasing needs for food and agriculture.

Participants were invited based on their expertise and regional work experience. This was to ensure that the major regions of the world, all of which contain domestic animal genetic resources (AnGR), were represented in the workshop. Participants also reflected a wide range of expertise in animal genetic resources. Experts participated in their personal capacities.

**II. Definition: Criteria, Indicators and Verifiers**

Development of criteria and indicators for assisting countries to characterize other sectors of biological diversity is underway elsewhere. Perhaps most notably, criteria and indicators are being developed to better define sustainable forest management, and to facilitate measurement of progress towards this goal. Development of sector specific criteria and indicators has been recognized by Parties to the Convention on Biological Diversity, as an important area to monitor and report on the status of biological diversity.

While universal definitions of the criteria, indicators and verifiers are lacking, they are generally accepted to be a hierarchy of assessment and description tools. In this report, criteria, indicators and verifiers are defined as follows:

**Criteria:** are the highest level in the hierarchy, and provide a basis from which livestock production environments can be described in increasing detail. For example, climate is an important variable that needs to be described in order to understand and categorize

production environments, and the environmental stressors to which different breeds in various location of the world are adapted to.

**Indicators:** is the second level in the hierarchy, - they are a subset of a criterion - and provide a basis to better describe and measure variables of the production environment. For example, temperature and day length, are indicators of climate having important influences on the adaptive fitness of breeds.

**Verifiers:** is the third level in the hierarchy - they are a subset of an indicator- and specify a particular element or measure of each indicator. For example, mean monthly temperature is a measure of the indicator temperature.

### **III. Workshop Rationale**

For particular production situations (production environments), the Global Strategy emphasizes the use and development of breeds of livestock which already possess high levels of adaptation; accepting that adaptive fitness is, to varying degrees production environment specific and is important to the maintenance and development of sustainable agricultural systems. Hence, to develop management action plans for their livestock breeds, including breeding goals and strategies, and to identify breeds of livestock elsewhere for potential use in a particular production environment, countries need to describe their primary production environments.

The adaptive fitness of breeds is complex and difficult to measure directly but that expected of a breed can be characterized by describing the intensity of the primary variables (criteria) which impact over time on an animal gene pool (breed) to maximize its adaptive fitness for that environment. Thus, a set of criteria, indicators and verifiers could be used to characterize (describe and assess) the production environment in which the breed is developing. The goal of the workshop was to determine an appropriate set of criteria, indicators and verifiers that can be used to characterize diverse livestock production environments in order to describe the adaptive fitness of breeds of all important farm animal species.

The current DAD-IS Breeds Database for country use in characterizing breeds does not provide for the description of the primary production environments in which the breeds have developed, in terms of the impact of these environments on animal breed adaptive fitness. Guidelines being developed by FAO for country use in action planning concerning the use, development and maintenance of these Animal Genetic Resources must incorporate criteria and indicators for assessing countries' primary production environments, providing for all avian and mammalian species of importance to food and agriculture production. Results of this workshop will be used to assist in developing guidelines for describing production environments and will also be made available via DAD-IS for use in characterizing the genetic resources developing in those environments.

#### **IV. Workshop Results**

1. A set of criteria was agreed to which can be used to characterize most or all production environments for all farm animal species. The five criteria identified are Climate; Terrain; Disease, Disease Complexes and Parasites; Resource Availability; and Management Interventions.
2. For each criterion a set of indicators were identified to better characterize these production environments.
3. For each indicator two or more verifiers were identified for use in describing each production environment.

*A graphical presentation of the criteria, indicators and verifiers is also attached as Diagrams 1 – 6 for background description.*

4. While the workshop did not attempt to develop a consensus set of recommendations, the following conclusions were extracted from the discussion. Workshop participants generally agreed that:
  - A system of criteria, indicators and verifiers that resulted in improved description of production environments would be extremely valuable, especially if the system improved understanding of the adaptive fitness of specific animal genetic resources at the breed level.
  - Many developing countries have very little capacity to collect and analyze production environment variables and therefore, the less complex the descriptive system the more likely it would be used.
  - The set of criteria, indicators and verifiers agreed to at the workshop should undergo initial field tests.
  - The system of criteria, indicators and verifiers should be provided to countries as soon as initial testing is complete, with an understanding that the system will evolve with use.
5. Results of the workshop have been used to develop a preliminary set of secondary guideline worksheets, which are attached to this report. These will be used to assist countries to better describe their primary production environments.
6. The results will also be designed into a production environment data collection and analytical system for incorporation into DAD-IS for country use.

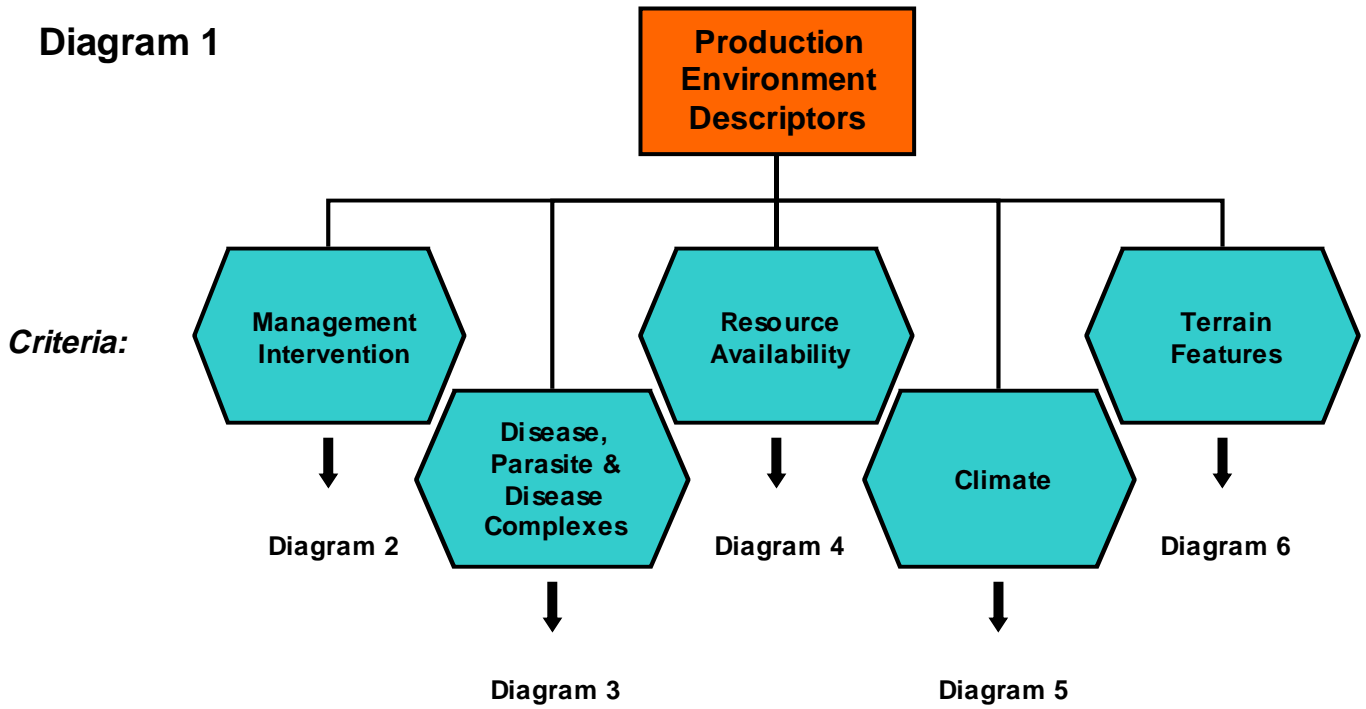
## Annex I

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**Diagram 1**





**Legend for Diagrams 2 to 6**


- Data structure

 **Criterion** Criterion (Highest level of classification)

 **Indicator** Indicator (Medium level of classification)

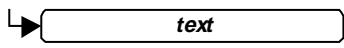
 **Indicator** Indicator of secondary importance, i.e. for inclusion in a later stage

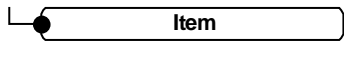
 **Verifier** Verifier (Lowest level of classification)

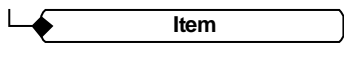
 **Comment** Additional explanation

- User input

 **x+ unit of measurement** User to enter a numerical value

 **text** User to enter text

 **Item** Item from a mutually exclusive value list from which the user has to choose

 **Item** Item from a checklist from which the user has to choose

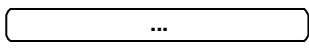
 **...** Repeated items part of a logical sequence



Diagram 2

# Management Intervention

Legend:  
See diagram 1

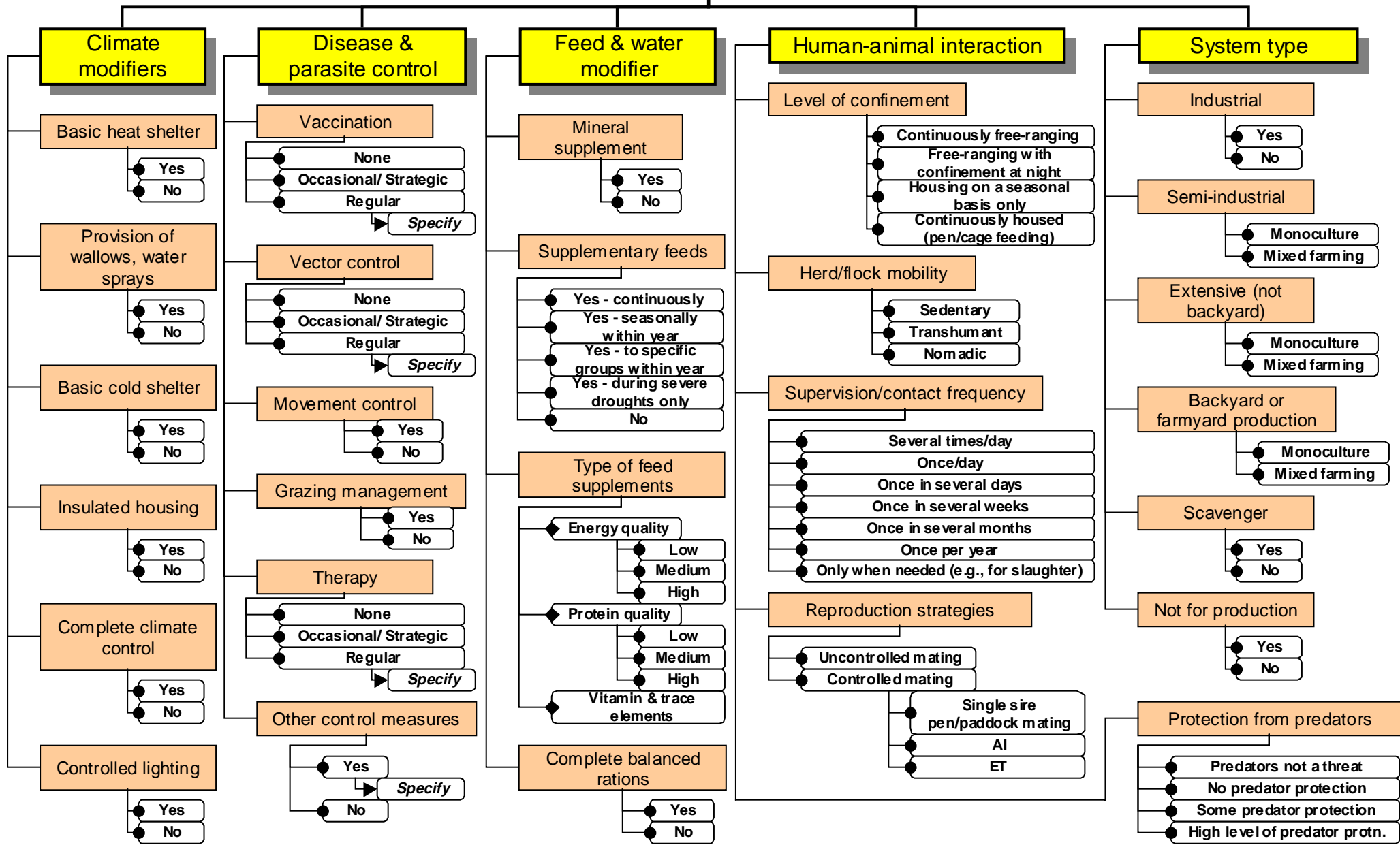


Diagram 3

**Disease, Parasite & Disease Complexes**

Legend:  
See diagram 1

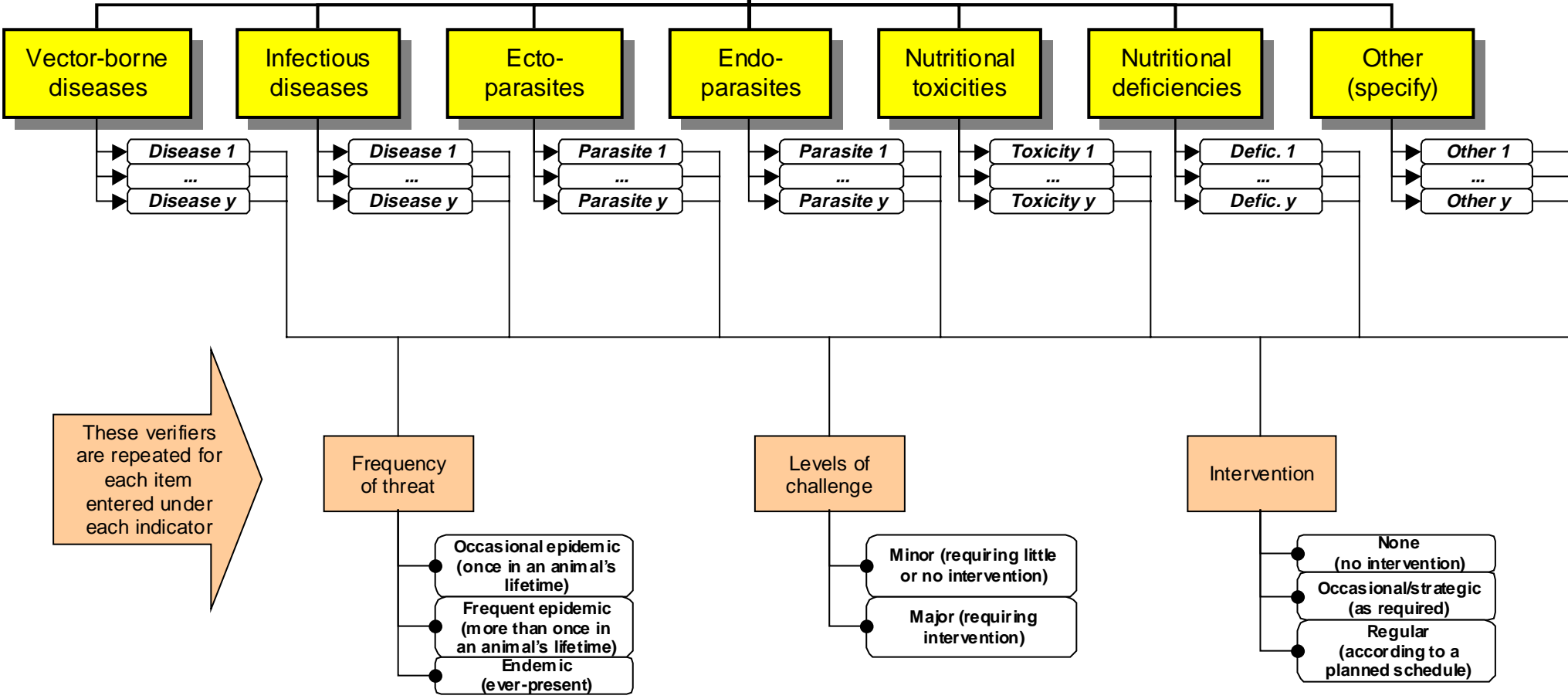


Diagram 4

# Resource Availability

Legend:  
See diagram 1

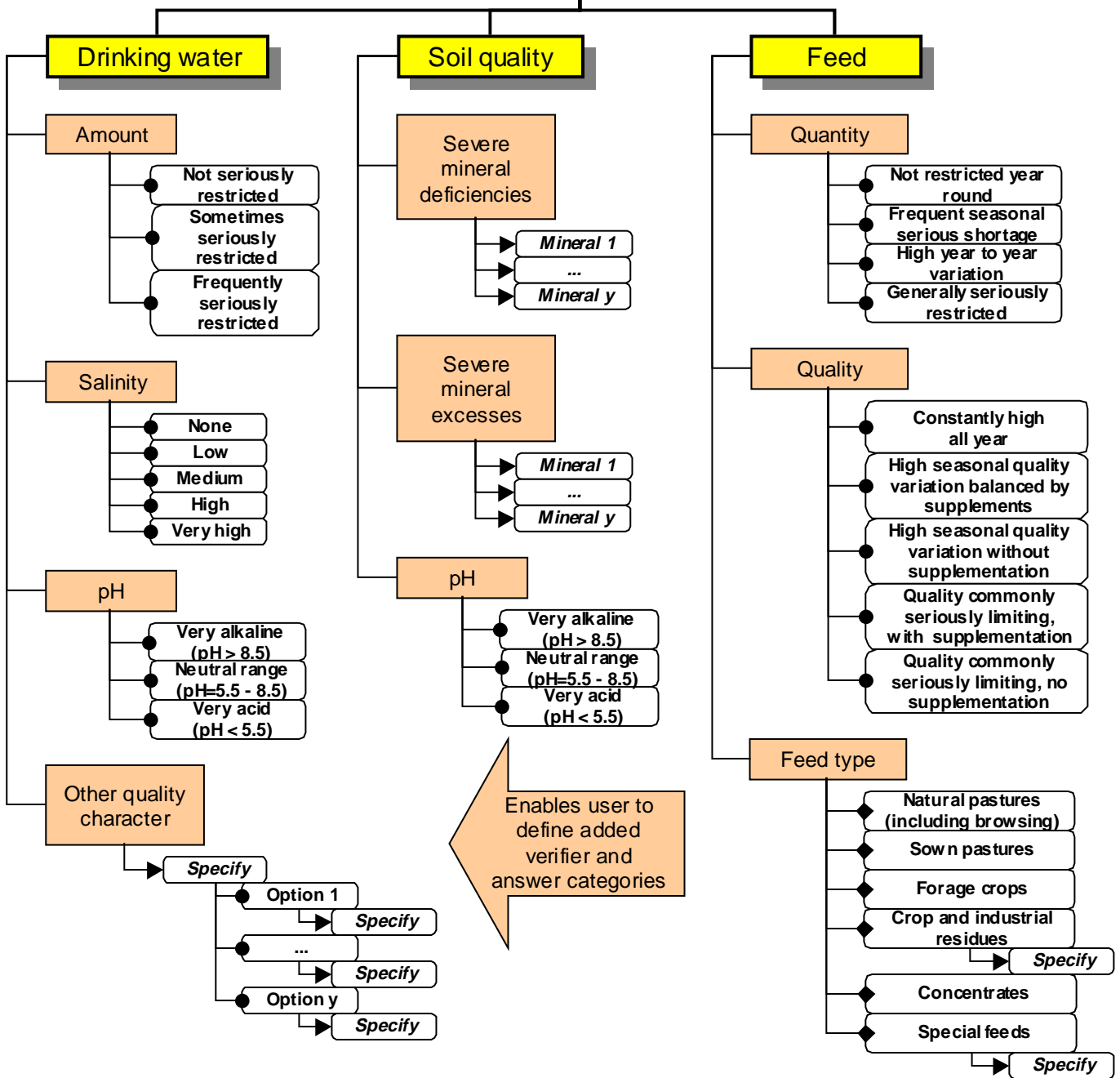


Diagram 5

**Climate**

Legend:  
See diagram 1

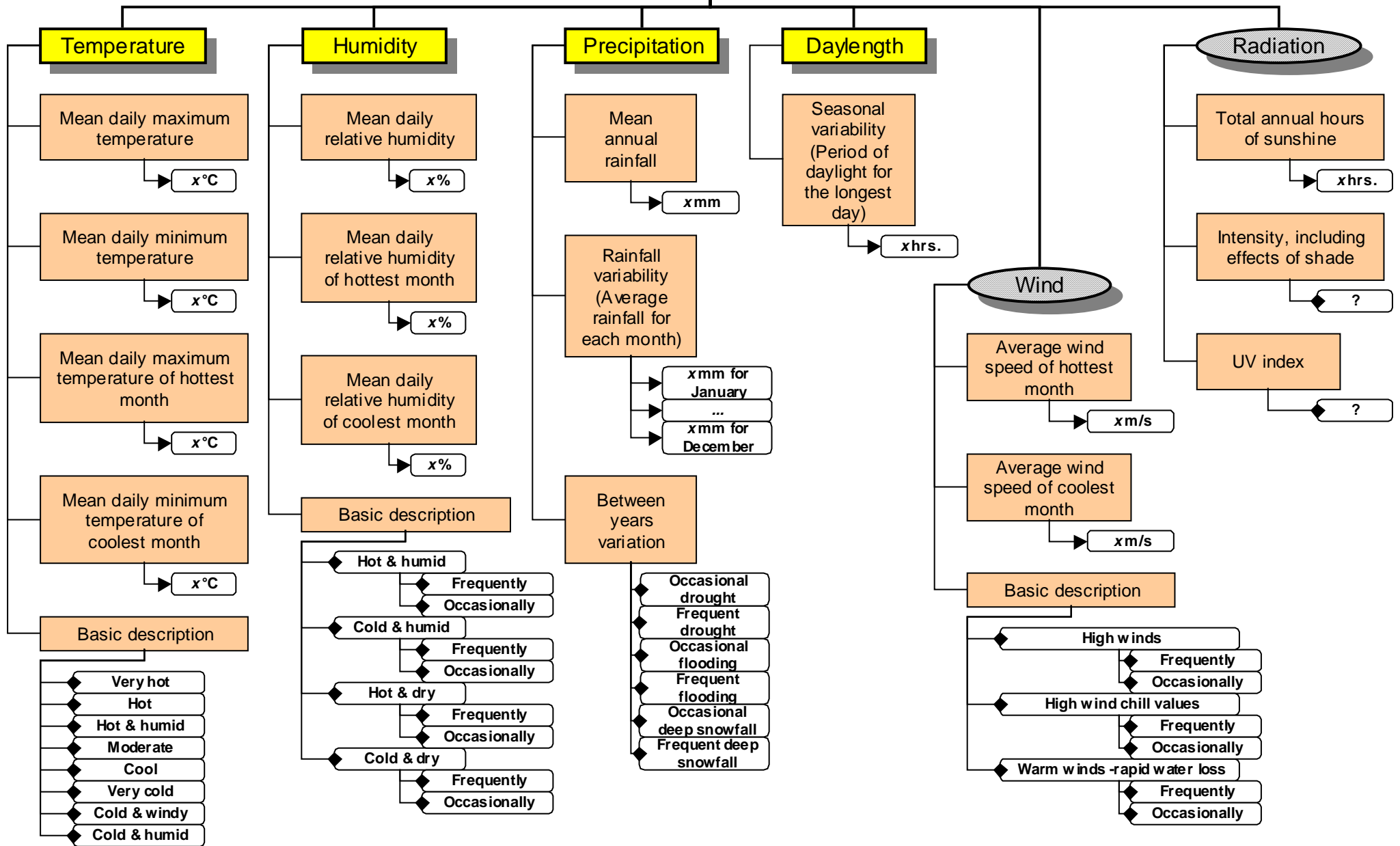
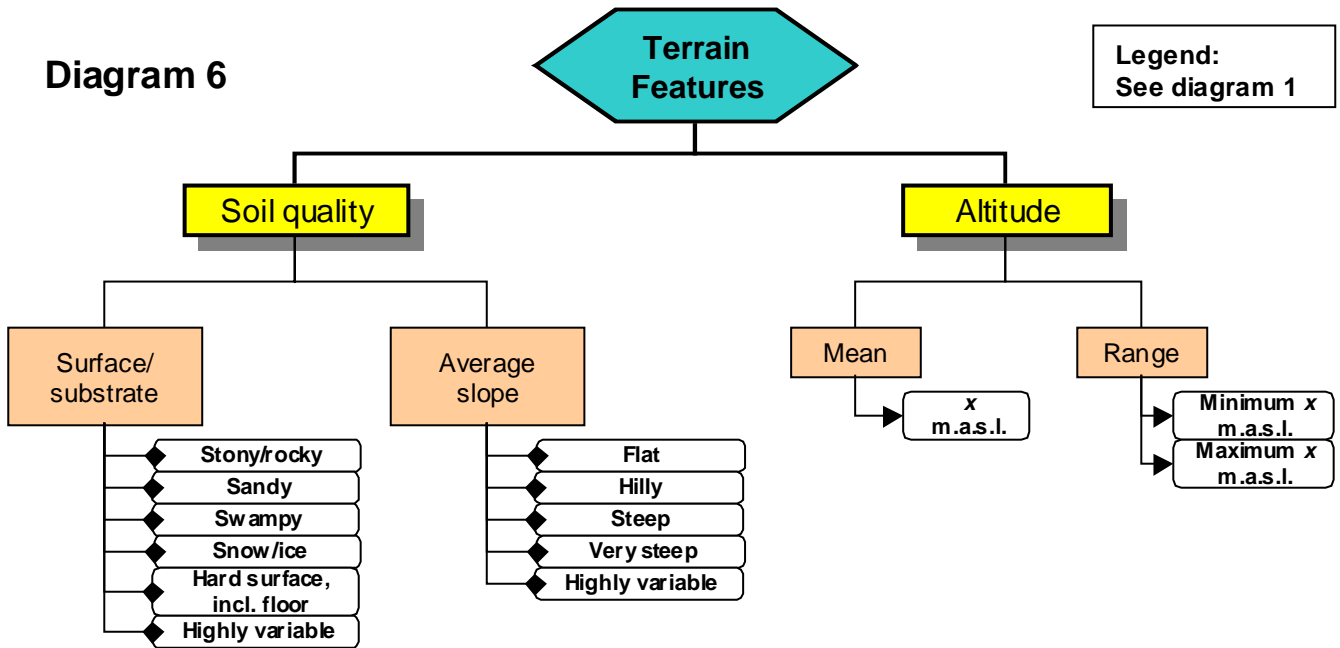


Diagram 6



# ***PRELIMINARY DRAFT GUIDELINES TO DESCRIBE PRIMARY PRODUCTION ENVIRONMENTS FOR EACH BREED OF DOMESTIC FARM ANIMALS***

## ***A. Introduction:***

The Primary Guidelines for Development of National Farm Animal Genetic Resources Management Plans are designed to assist countries obtain an overview of the activities involved in developing a sound AnGR management strategy. The essential activities are grouped into four elements, characterization of AnGR, livestock production descriptions, active breed use and development, and managing populations of AnGR at risk. The technical detail required to plan and conduct each of the essential activities is being developed as a series of Secondary Guidelines, also being developed by FAO, for country use in action planning.

Characterizing the production environments in which a country's breed resources are developing is a necessary activity for assessing the role of each AnGR, with the resulting information base being used for making decisions on access to, use, development and conservation of the nations' AnGR of each farm animal species. These Secondary Guidelines will assist countries to identify and describe the production environment that each breed is developing in and the DAD-IS breed databank provides for collation and maintenance of the collected data.

These preliminary guidelines have been developed based on the advice provided by a group of experts and will be further refined as experience is gained from use within countries. The guidelines have been prepared to allow for the variation in the quantity and quality of data and information currently available to countries. They also provide significant opportunities to provide data and information that describes unique breed responses to different production environment variables.

Definitions have been provided to assist completion of the worksheets.

## ***B. Describing Breed Production Environments - Worksheets***

### **Introduction:**

To assist countries to describe their primary production environments the following worksheets are provided. They are based on a set of criteria, indicators and verifiers that were agreed to by a group of experts in January of 1998, and are provided as a framework to be used to characterize most or all production environments for all farm animal species.

The five criteria identified are Climate; Terrain; Disease, Disease Complexes and Parasites; Resource Availability; and Management Interventions. For each criterion a set of indicators is provided and for each indicator two or more verifiers are provided to better characterize these production environments. The framework provided by the criteria, indicators and verifiers is presented as a series of diagrams in Annex II.

### **Instructions:**

**For each breed, complete the following worksheets. If the breed exists in more than one primary production environment, complete a separate worksheet for each production environment. That is,** a worksheet should be completed for each breed and each primary production environment it exists in. A single breed may exist in several production environments, and thus, will require a description of each major production it exists in. **Participants are asked to begin the worksheets by providing some basic information on the breed whose production environment is being described.**

**Provide all of the information that you currently have for each section. The sections are related but are independent and therefore, you do not need complete information for every section in order to fill out the worksheets. Missing data can be included in future. Note that in some sections only one box should be marked, while in other sections more than one box may be marked. Definitions have been provided to assist completion of the worksheets (Annex I).**

**Completing the worksheets will require participation or involvement of various experts that have adequate knowledge of each countries primary production environments.**

**Note: accurate and comprehensive data and information is required to successfully describe primary production environments in order to determine variation in selection pressures across production environments. A single breed may exist in several production environments within a country. Accurate completion of the worksheets should provide a means to characterize diverse livestock production environments in order to better understand the comparative adaptive fitness of different breeds of farm animal species. This information can contribute significantly to planning breed development and use, and breed conservation approaches.**

**I. Breed Data and Information:**

1. Breed name:
  
2. Geographic location of the breed (location of the production environment):
  
3. Main uses of the breed in this production environment (from a checklist):
  
4. Length of time that the breed has been in this particular production environment:  
  
< 10 years       10 – 50 years       > than 50 years
  
5. Population size in this particular production environment:
  
6. Breed partuation period:
  
7. Breed reproductive period:

**Note: this section of the worksheets will be further developed during the field test to ensure that appropriate information is collected.**



**II. Breed Production Environment Data and Information:**

**1. Criterion One – MANAGEMENT INTERVENTION:**

1.1 **Climate Modifiers** – Mark the boxes that best describes the climatic modifiers that are used. More than one box can be marked.

*Most breeding animals of the breed are provided with:*

- Basic heat protection shelters provided
- Basic cold protection shelters provided
- Wallows, water sprays, etc. for cooling provided
- Insulated housing provided
- Complete climate control housing provided
- Controlled lighting provided

1.2 **Disease and Parasite Control** – Mark the boxes that best describes the disease and parasite control measures that are employed. Mark one box.

**Vaccinations - *Most animals of the breed are:***

- Never vaccinated
- Vaccinated occasionally/strategically
- Vaccinated regularly

***List the disease types that vaccinations are provided for:***

***Vector control is:***

- Rarely or never used to control diseases and parasites or their effects
- Occasionally/strategically employed to control diseases and parasites or their effects
- Employed on a regular basis to control diseases and parasites or their effects

***List the types of vector-controls used:***

***Therapy is:***

- Never employed to control diseases and parasites

Employed on an occasional/strategic basis to control diseases and parasites or their effects

Employed on a regular basis to control diseases and parasites or their effects

***Animal movement is controlled to control/prevent diseases and parasites:***

Animal movements are controlled within breed populations in order to control or prevent diseases and parasites

Grazing management systems are employed to control disease and parasites or their effects

***Other Control Measures for Diseases & Parasites:***

**List any other methods that are used to control or prevent diseases and parasites (e.g. total slaughter).**

**1.3 Feed and Water Modifiers – Mark the most appropriate box.**

**Provision of Mineral Supplements:**

Mineral supplements are commonly provided to the breeding animals of the breed

**Provision of Feed Supplements:**

Supplementary feeds are commonly continuously provided to the breeding animals of the breed

Supplementary feeds are provided seasonally (within the year)

Supplementary feeds are provided to specific groups within the year

Supplementary feeds are only provided during severe droughts

Supplementary feeds are never provided to most breeding animals

**Supplementary Feed Types:**

Energy feeds are commonly provided to most breeding animals

*If so, mark one of the following:*

*Energy feeds provided are of low quality*

*Energy feeds provided are of medium quality*

*Energy feeds provided are of high quality*

Protein feeds are provided

*If so, mark one of the following:*

*Protein feeds provided are of low quality*

*Protein feeds provided are of medium quality*

*Protein feeds provided are of high quality*

*Vitamins and Trace Elements are provided to most breeding animals*

*Complete balanced rations are provided to most breeding animals*

**1.4 Human-livestock interactions** – Mark the most appropriate box that best describes the human-livestock interactions. Mark one box per section.

**Level of Confinement:**

Most animals are continuously free-ranging

Most animals are free-ranging with confinement at night

Housing provided on a seasonal basis to most animals

Continuous housing (pen/cage) provided to most animals

Level of Herd/Flock Mobility: In terms of herd or flock movement, the production system in common use is best described as:

Sedentary  Transhumant  Nomadic

**Level of Supervision/Contact with livestock- Livestock managers inspect livestock:**

Several times per day

Once per day

Once in several days

Once in several weeks

- Once in several months
- Once per year
- Only when required (e.g. for sale or slaughter)

**Level of Predator Protection Provided:**

- Predators are not generally a threat to the breed in this production environment
- No predator protection is provided
- Some level of predator protection is provided
- A high level of predator protection is provided

**Types of reproductive strategies generally employed by farmers for breeding stock of the breed. More than one box can be marked.**

- Uncontrolled mating
- Controlled mating
- If controlled mating is employed, mark the strategies used:
- Hand or pen mating, including single sire mating groups
- Artificial insemination
- Embryo transfer

**1.5 Management System Type**

**Using the following management type categories for generally describing intensity of the management system mark the box that best describes the production environments. Only one box should be marked for each production environment.**

- Industrial
- Semi-industrial monoculture
- Semi-industrial mixed farming
- Extensive (not backyard) monoculture
- Extensive (not backyard) mixed farming
- Backyard or farmyard production monoculture

- Backyard or farmyard production mixed farming
- Scavenger system
- Not for production

**Criterion Two - DISEASE, PARASITES & DISEASE COMPLEXES**

*Name the major diseases for the breed in this production environment. For each disease, only mark one box in the appropriate sections.*

**2.1 Vector-borne Diseases:** *Name the major Vector-borne Diseases for the breed in this production environment.*

**Frequency of Threat** - Mark the most appropriate box that indicates the frequency of the disease. The disease is:

- Endemic (ever present)
- Occasional epidemic (once in an animals lifetime)
- Epidemic (more than once in an animals lifetime)

**Level of Challenge** - Mark the most appropriate box that indicates the severity of threat of each disease. The disease is:

- MINOR (requiring little or no intervention)
- MAJOR (requiring intervention)

**Level of Intervention** - Mark the most appropriate box that describes the human action taken to ameliorate the effects of the disease.

- No intervention is required
- Occasional/strategic intervention as required
- Regular intervention (according to a planned schedule) is required

**2.2 Infectious Diseases:** *Name the Major Infectious Diseases:*

Frequency of Threat - Mark the most appropriate box. The disease is: Endemic

- (ever present)
- Occasional epidemic (once in an animals lifetime)
- Epidemic (more than once in an animals lifetime)

**Level of Challenge** - Mark the most appropriate box that indicates the severity of threat of each disease. The disease is:

MINOR (requiring little or no intervention)

MAJOR (requiring intervention)

**Level of Intervention** - Mark the most appropriate box that describes the human action taken to ameliorate the effects of the disease.

No intervention is required

Occasional/strategic intervention as required

Regular intervention (according to a planned schedule) is required

### 2.3 Ectoparasites: *Name the Major Ectoparasites:*

Frequency of Threat - Mark the most appropriate box that indicates the frequency of the parasite. The parasites is:

Endemic (ever present)

Occasional epidemic (once in an animals lifetime)

Epidemic (more than once in an animals lifetime)

**Level of Challenge** - Mark the most appropriate box that indicates the severity of threat of each parasite. The parasite is:

MINOR (requiring little or no intervention)

MAJOR (requiring intervention)

**Level of Intervention** - Mark the most appropriate box that describes the human action taken to ameliorate the effects of the parasite.

No intervention is required

Occasional/strategic intervention as required

Regular intervention (according to a planned schedule) is required

### 2.4 Endoparasites: *Name the major Endoparasites:*

**Frequency of Threat** - Mark the most appropriate box which indicates the frequency of the parasite. The parasites is:

Endemic (ever present)

Occasional epidemic (once in an animals lifetime)

The parasite is epidemic (more than once in an animal's lifetime)

**Level of Challenge** - Mark the most appropriate box. The parasite is:

MINOR (requiring little or no intervention)

MAJOR (requiring intervention)

**Level of Intervention** - Mark the most appropriate box.

No intervention is required

Occasional/strategic intervention as required

Regular intervention (according to a planned schedule) is required

**2.5 Nutritional Toxicity's: Name the major nutrient toxicity's in each major production environment:**

Frequency of Threat - Mark the most appropriate box. The nutrient toxin when in excess, frequently:

Causes physiological disorders

Is lethal

Affects feeding, reproduction & lowers overall animal output

**Level of Challenge** - Mark the most appropriate box. The nutrient toxin is:

A MINOR concern (requiring little or no intervention in any breeds)

A MAJOR problem (requiring intervention in some breeds)

**Level of Intervention** - Mark the most appropriate box.

No intervention is required

Occasional/strategic intervention as required

Regular intervention (according to a planned schedule) is required

**2.6 Nutritional Deficiencies: Name the major nutrient deficiencies in each major production environment:**

Frequency of Threat - Mark the most appropriate box. The nutrient deficiency frequently:

Causes physiological disorders

Is lethal

Affects feeding, reproduction & lowers overall animal output

**Level of Challenge - Mark the most appropriate box.**

**The nutrient deficiency is:**

A MINOR concern - requiring little or no intervention in any breeds

A MAJOR problem - requiring intervention in some breeds

**Level of Intervention - Mark the most appropriate box.**

No intervention is required

Occasional/strategic intervention as required

Regular intervention (according to a planned schedule) is required

**2.7 List other known diseases:**

**2.8 Other Known Breed Characteristics Relevant to Disease and Parasitism:**

**Based on your knowledge of the breed and for diseases and parasites known to be important in this production environment, mark the boxes that you believe are characteristics of this breed.**

***(Name of Disease) - The breed:***

Is extremely tolerant to the disease

Is tolerant to the disease

Has low tolerance to the disease

Has very low or no tolerance to the disease

***(Name of Parasite) - The breed:***

Is extremely tolerant to the parasite

Is tolerant to the parasite

Has low tolerance to the parasite

Has very low or no tolerance to the parasite



*(Name of the nutrient toxin) - The breed:*

- Is extremely tolerant of the nutrient toxin
- Is tolerant of the nutrient toxin
- Has low tolerance to the nutrient toxin
- Has very low or no tolerance of the nutrient toxin

*(Name of the nutrient deficiency) - The breed:*

- Is extremely tolerant of the nutrient deficiency
- Is tolerant to the nutrient deficiency
- Has low tolerance to the nutrient deficiency
- Has very low or no tolerance of the nutrient deficiency

**Criterion Three - RESOURCE AVAILABILITY:**

**3.1 Drinking Water Quantity & Quality:**

**Drinking Water Quantity (Availability) – Mark one box.**

**Drinking water is:**

- Normally not restricted
- Occasionally seriously restricted
- Frequently seriously restricted

**Drinking Water Quality:**

**Salinity - Describe water quality in terms of concentrations of sodium chloride in the drinking water. Mark only one box. Sodium chloride is**

- Not present
- Present in low concentrations
- Present in medium concentrations
- Present in high concentrations
- Present in very high concentrations

**pH - Describe the pH of the drinking water available.** Mark one box.

The drinking water is:

Alkaline (pH > 8.5)

Neutral (pH between 5.5 & 8.5)

Acidic (pH < 5.5)

### 3.2 Soil Quality:

**Soil pH - Describe the soil pH.** Mark one box.

**The soil is:**

Very alkaline (pH > 8.5)

Neutral (pH between 5.5 & 8.5)

Very acidic (pH < 5.5)

**Mineral excesses and Deficiencies - Describe any severe soil mineral excesses or deficiencies in sections 2.5 and 2.6.**

### 3.3 Feed Characteristics:

**Feed Quantity - Describe the feed quantity available to the livestock.** Mark one box.

**Feed Quantity is:**

Not restricted year round

Frequently seriously restricted during periods of the year

Frequently seriously restricted from year-year

Generally seriously restricted

**Feed Quality - Describe the feed quality available to the livestock.** Mark one box.

**Feed Quality is:**

High year round

Varies seasonally and is balanced with supplements

Varies seasonally but is not balanced with supplements

Commonly seriously limiting but supplements generally not provided

Commonly seriously limiting, therefore supplements are provided

**Feed Type- Describe the primary feed types available. Mark one box.**

Natural pastures, including browse type vegetation

Cultivated and zero till - sown pastures

Forage crops

Crop & Industrial residues

Concentrates

Special feeds

**Specify special feeds by types, (e.g. the Ronaldsay sheep breed feeds almost solely on kelp at the ocean shore).**

**Feed Toxicity's - Specify any toxic feeds that are found in each major production environment in sections 2.5)**

### **3.4 Other Known Breed Characteristics Relevant to Resource Availability:**

Based on your knowledge of the breed, mark the boxes that you believe are characteristics of this specific breed.

**The breed can tolerate:**

Low availability of drinking water

High saline drinking water

High pH drinking water

Low pH drinking water

High variations in feed quantity/availability

High variations in feed types

List particular toxins in available feed that other breeds cannot tolerate

## **Criterion Four – CLIMATE**

**4.1 Temperature:** *Provide the distance in kilometres from the production environment you are describing and the weather station that you acquired the data from.*

Distance weather station is located from the production environment  km

Mean daily maximum temperature  °C

Mean daily minimum temperature  °C

Daily maximum temperature of the hottest month of the year  °C

Daily minimum temperature for the coldest month of the year  °C

*If you do not have data to complete the above, then mark the boxes which best describes the variation in temperature found in each production environments. You may mark more than one box.*

Very Hot  Hot  Hot & Humid

Moderate  Cool  Very Cold

Cold & Windy  Cold & Humid

#### 4.2 Relative Humidity

Mean daily relative humidity  %

Mean daily relative humidity of the hottest month of the year  %

Mean daily relative humidity of the coldest month of the year  %

*If you do not have data to complete the above, then mark the boxes which best describes the relative humidity and variation of the production environment. You may mark more than one box.*

Frequently Hot & Humid  Occasionally Hot & Humid

Frequently Cold & Humid  Occasionally Cold & Humid

Frequently Hot & Dry  Occasionally Hot & Dry

Frequently Cold & Dry  Occasionally Cold & Dry

### 4.3 Precipitation

Mean annual rainfall  mm

Average rainfall each month of the year:

<input type="text"/> mm Jan.	<input type="text"/> mm Feb.	<input type="text"/> mm Mar.	<input type="text"/> mm April
<input type="text"/> mm May	<input type="text"/> mm June	<input type="text"/> mm July	<input type="text"/> mm Aug.
<input type="text"/> mm Sep.	<input type="text"/> mm Oct.	<input type="text"/> mm Nov.	<input type="text"/> mm Dec.

Mean annual snowfall:  mm

Average snowfall each month of the year

<input type="text"/> mm Jan.	<input type="text"/> mm Feb.	<input type="text"/> mm Mar.	<input type="text"/> mm April
<input type="text"/> mm May	<input type="text"/> mm June	<input type="text"/> mm July	<input type="text"/> mm Aug.
<input type="text"/> mm Sep.	<input type="text"/> mm Oct.	<input type="text"/> mm Nov.	<input type="text"/> mm Dec.

**Check one of the following boxes to best describe between year precipitation variation.**

Occasional drought	<input type="checkbox"/>	Frequent drought	<input type="checkbox"/>
Occasional flooding	<input type="checkbox"/>	Frequent flooding	<input type="checkbox"/>
Occasional deep snowfall	<input type="checkbox"/>	Frequent deep snowfall	<input type="checkbox"/>

**4.4 Wind Conditions** – You may mark more than one box.

Occasional high winds	<input type="checkbox"/>	Frequent high winds	<input type="checkbox"/>
Occasional high wind chill values	<input type="checkbox"/>	Frequent high wind chill values	<input type="checkbox"/>
Occasional warm winds - rapid water loss conditions			<input type="checkbox"/>
Frequent warm winds - rapid water loss conditions			<input type="checkbox"/>

If the data is available, provide:

Average wind speed for the hottest month of the year  km/hour

Average wind speed for the coldest month of the year  km/hour

**Note: the best scoring approach describe the effect of day length and radiation is still being developed.**

#### 4.5 Day length Period

Hours of sunlight for the longest day of the year

Total annual hours of sunlight

#### 4.6 Radiation

Check the most appropriate box for each of the production environments:

- |  |                          |
|--|--------------------------|
| Frequently high UV index reading           | <input type="checkbox"/> |
| Occasionally high UV index reading         | <input type="checkbox"/> |
| Total annual hours of sunshine             | <input type="checkbox"/> |
| Intensity including the effects of shading | <input type="checkbox"/> |

#### 4.7 Other Known Breed Characteristics Relevant to Climate:

Based on your knowledge of the breed, mark the boxes that you believe are characteristics of this specific breed. The breed is:

- |   |                          |
|---|--------------------------|
| Heat tolerant, including warm winds, rapid moisture loss conditions | <input type="checkbox"/> |
| Heat/high-humidity tolerant   | <input type="checkbox"/> |
| Cold tolerant - including high wind chills                          | <input type="checkbox"/> |
| Cold/high-humidity tolerant   | <input type="checkbox"/> |
| Drought tolerant  | <input type="checkbox"/> |
| Adapted to deep snowfall  | <input type="checkbox"/> |
| Adapted to moderately deep snowfall                                 | <input type="checkbox"/> |

Adapted to a particular annual photo-period

Adapted to high solar radiation

**5. Criterion Five - TERRAIN FEATURES:**

5.1 **Altitude** - Provide data in metres above sea level (m.a.s.):

Mean altitude for this production environment  m.a.s

Lowest altitude for this production environment  m.a.s

Highest altitude for this production environment  m.a.s

5.2 **Elevation/slope** – Describe the elevation/slope by marking the most approximate box. *The production environment has:*

Relatively flat terrain

Relatively hilly terrain

Relatively steep terrain

Very steep terrain

Highly variable terrain (flat, rolly & steep)

5.3 **Surface/ Substrate conditions** - Describe the main substrate conditions on which animals are generally maintained. You may mark more than one box.

*The production environment substrate is:*

Stony/rocky

Sandy

Commonly Wet - with very swampy substrate conditions

Highly variable in substrate types

Frequently covered with snow & ice

Occasional covered with snow & ice

Man-made such as cement, wood and wire floors

#### 5.4 Other Known Breed Characteristics Relevant to Terrain:

**The breed is:**

- Adapted to high altitude environments
- Adapted to moderate to very steep terrain
- Able to use a wide variety of substrate types
- Adapted to extremely stony/rocky substrates
- Adapted to extremely sandy substrates
- Adapted to snowy & iced substrate conditions
- Adapted to man-made substrates
- Able to traverse extremely steep terrain
- Able to travel extremely long distances

#### 6.0 Provide any other descriptive information about the breed or its production environment that may be relevant to adaptive fitness.

### *C. Definitions - Criteria, Indicators and Verifiers:*

**Production Environment Criteria:** Are the highest level of categories that provide a basis to describe production environment characteristics. Five criteria have been identified to provide the basis to describe the primary production environments for each breed within a country. The five criteria are 1) Management Intervention; 2) Disease, Disease Complexes and Parasites; 3) Resource Availability; 4) Climate and 5) Terrain.

**Production Environment Indicators:** Are a level of categories below the criterion level that provide a basis to better describe and measure production environment characteristics. Two or more indicators are provided for each criterion. They are defined below.

**Production Environment Verifiers:** Are the lowest level of categories that provide a basis to describe and measure specific elements of each major production environment for the breeds of domestic animals. Two or more verifiers are provided for each indicator. They are defined below.

1. **CRITERIA – MANAGEMENT INTERVENTION:** refers to any interventions or actions that affect parent or offspring survival or reproductive success of most animals of the breed.



**Management Indicators** – Five management indicators (or modifiers) are provided for use in describing the attributes or components of this criterion. These are: Climatic Modifiers; Disease & Parasite Control; Feed & Water Modifiers; Human-Livestock Interactions; and Production System Management Types.

## **Indicators and Verifiers:**

**1.1 Climatic Management Intervention Indicators:** are any human actions taken to modify climate factors influencing the breed to improve production, productivity and or product quality.

**Basic heat protection shelters:** are provided to protect animals from high or extreme heat conditions.

**Basic cold protection shelters:** are provided to protect animals from high or extreme cold conditions, including high wind chill values.

**Wallows, water sprays, etc.:** are provided for livestock to cool themselves.

**Insulated housing:** is housing provided to reduce livestock exposure too cold or hot climatic conditions.

**Complete climatic control housing:** is climatic control housing provided to regulate temperature and other climatic variables.

**Controlled lighting photoperiod:** is lighting provided to increase production and/or productivity.

**1.2 Disease and Parasite Controls:** are any human actions taken to eliminate, prevent or reduce the diseases and parasites, or the negative effects of diseases and parasites in this production environment.

**Vaccinations:** frequency that this management intervention is used to control or prevent the spread of diseases and parasites, or are used to prevent or reduce negative impacts of diseases and parasites. Specific vaccination types need to be specified for each breed.

**Vector Control:** frequency that this management intervention is used to control or prevent the spread of diseases and parasites or negative impacts of diseases and parasites. Specific vector controls need to be specified for each breed.

**Therapy:** frequency that this method is used to control or reduce the spread of diseases and parasites or negative impacts of diseases and parasites. Disease and therapy types need to be specified for each breed.

**Control of Livestock Movements:** are livestock movements controlled to control or prevent the spread of diseases and parasites, or to reduce or prevent negative

impacts of diseases and parasites. These approaches need to be described for each breed.

**Grazing Management Systems:** are grazing systems employed to control or prevent the spread of diseases and parasites or negative impacts of diseases and parasites. These should be described.

**1.3 Feed and Water Modifiers:** are any inputs that are intended to improve water and feed quantity and quality.

**Mineral Supplements:** are mineral supplements used to maintain livestock, improve livestock production or productivity.

**Supplementary Feeds:** are feed supplements used to maintain livestock, improve livestock production or productivity or product quality.

**Types of Feed Supplements:** if feed supplements are used to maintain livestock, improve livestock production or productivity or product quality, the types should be listed.

**Complete Balanced Rations:** are feed mixes designed to be wholesome, i.e. to provide all essential nutrients required to improve livestock production or productivity or product quality.

**1.4 Human-Livestock Interactions:** refers to the nature and extent of the interaction or contact between livestock and livestock managers (persons responsible for the management of the animals).

**Level of Confinement:** refers to the general level of confinement of animals of the breed, described as continuously free-ranging, free-ranging with confinement at night, housing on a seasonal basis only, continuously housed.

**Mobility:** is a production environment classification system based on three categories of movements of the herd or flock of the breed over time. The classes are sedentary, transhumant and nomadic.

**Supervision:** refers to the frequency livestock managers inspect the livestock (a list is provided to choose from in the worksheets).

**Protection from predators:** refers to deliberate action taken by livestock managers to reduce or remove threats to livestock from predators.

**Reproduction Strategies:** refers to the type of reproductive strategy that is generally employed by farmers for each breed (a list is provided to choose from in the worksheets).

**1.5 Livestock Management System Type:** refers to a general classification system that best describes the intensity of the management system. Nine system types are

provided including: Industrial, Semi-industrial Monoculture, Semi-industrial Mixed Farming, Extensive (not backyard) Monoculture, Extensive (non backyard) Mixed-farming, Backyard or Farmyard Production Monoculture, Backyard or Farmyard Production Mixed-farming, Scavenger and Not for Production systems. (*Definitions for System Types currently being finalized*).

2. **CRITERIA - DISEASE, DISEASE COMPLEXES & PARASITES:** are all factors affecting the health of livestock in a specified production environment.

**Disease, Disease Complexes and Parasite Indicators** - six indicators are provided for use in describing the attributes or components of this criterion. They are: Vector-Borne Diseases, Infectious Diseases, Ectoparasites, Endoparasites, Nutritional Toxicity's and Nutrient Deficiencies. Space is provided for other indicators to be provided as experience in using this system is gained.

### **Indicators and Verifiers:**

- 2.1 **Vector-Borne Diseases** – are diseases that require another organism to act as a vehicle to transmit the disease from one host to another, including tick-borne diseases and trypanosomiasis, etc.

**Frequency:** refers to the frequency of the disease defined as endemic (ever present) occasional (once in an animals lifetime), and frequent (more than once in an animals lifetime).

**Level of Challenge:** refers to the impact of the disease defined as Minor (requiring little or no intervention) or Major (requiring intervention in this breed).

**Intervention Frequency:** refers to the frequency intervention is required to control or prevent the disease or the negative effects of the disease as defined as no intervention required, occasional or strategic interventions (as required), and regular interventions (according to a planned schedule).

- 2.2 **Infectious Diseases** – are airborne diseases or transmitted through direct contact (not reliant on a vector).

**Frequency:** refers to the frequency of the disease defined as endemic (ever present) occasional (once in an animals lifetime), and frequent (more than once in an animals lifetime).

**Level of Challenge:** refers to the impact of the disease defined as Minor (requiring little or no intervention) or Major (requiring intervention in this breed).

**Intervention Frequency:** refers to the frequency intervention is required to control or prevent the disease or the negative effects of the diseases as defined as no intervention required, occasional or strategic interventions (as required), and regular interventions (according to a planned schedule).

**2.3 Ectoparasites** – are parasites that inhabit the exterior parts of the host body.

**Frequency:** refers to the frequency of the parasite defined as endemic (ever present) occasional (once in an animals lifetime), and frequent (more than once in an animals lifetime).

**Level of Challenge:** refers to the impact of the parasite defined as Minor (requiring little or no intervention) or Major (requiring intervention in this breed).

**Intervention Frequency:** refers to the frequency intervention is required to control or prevent the parasites or the negative effects of the parasites as defined as no intervention required, occasional or strategic interventions (as required), and regular interventions (according to a planned schedule).

**2.4 Endoparasites** – are parasites that spend some part of their life cycle inside the body of the host.

**Frequency:** refers to the frequency of the parasite defined as endemic (ever present) occasional (once in an animals lifetime), and frequent (more than once in an animals lifetime).

**Level of Challenge:** refers to the impact of the parasite defined as Minor (requiring little or no intervention) or Major (requiring intervention in this breed).

**Intervention Frequency:** refers to the frequency intervention is required to control or prevent the parasites or the negative effects of the parasites as defined as no intervention required, occasional or strategic interventions (as required), and regular interventions (according to a planned schedule).

**2.5 Nutritional Toxicity's** – results from toxins found in feeds or water contaminants, that are known to cause physiological disorders in livestock, and can be lethal. Known breed tolerances to feed and water toxins should be provided.

**Frequency:** refers to the frequency of the toxin defined as endemic (ever present) occasional (once in an animals lifetime), and frequent (more than once in an animals lifetime).

**Level of Challenge:** refers to the impact of the toxin defined as Minor (requiring little or no intervention) or Major (requiring intervention in this breed).

**Intervention Frequency:** refers to the frequency intervention is required to control or prevent the negative effects of the toxin as defined as no intervention required, occasional or strategic interventions (as required), and regular interventions (according to a planned schedule).

**2.6 Nutritional Deficiencies** - results from required levels of essential macro- and micro-nutrients in feed and water not being sufficient to meet physiological requirements.

**Frequency:** refers to the frequency of the nutritional deficiency defined as endemic (ever present) occasional (once in an animals lifetime), and frequent (more than once in an animals lifetime).

**Level of Challenge:** refers to the impact of the nutritional deficiency defined as Minor (requiring little or no intervention) or Major (requiring intervention in this breed).

**Intervention Frequency:** refers to the frequency intervention is required to prevent negative effects of the nutritional deficiency as defined as no intervention required, occasional or strategic interventions (as required), and regular interventions (according to a planned schedule).

**2.7 Other Diseases** – are any other diseases that do not fit one of the above categories and are known to effect livestock production, productivity or product quality.

3. **CRITERIA - RESOURCE AVAILABILITY:** refers to the general availability of essential water, soil and feed resources to the breed within the specified production environment; particularly as they influence breed reproduction and animal survival. **Resource Availability Indicators** - three indicators are provided for use in describing the attributes or components of this criterion, these are: Drinking Water, Soil Quality and Feeds.

#### **Indicators and Verifiers:**

##### **3.1 Drinking Water – Quantity and Quality**

**Quantity:** refers to the amount of water available to livestock in the specific production environment over time, (within year and annual variation).

**Salinity** – drinking water quality defined by the relative concentration of sodium chloride.

**pH** – the pH of the drinking water expressed in absolute values or as alkaline, neutral or acidic.

**Other Features** – describe any special feature of the drinking water that is known to affect livestock or special feature of a breed that is adapted to a particular water characteristic.

**3.2 Soil Quality** - key soil quality characteristics that affect specific breeds in specific production environments. This includes mineral deficiencies, mineral excesses and soil pH.

**Mineral excesses and deficiencies** – severe soil quality conditions that impact seriously on livestock.

**pH** – soil pH expressed in absolute values or as alkaline, neutral or acidic.

**3.3 Feed** – refers to the amount and quality of types of feed available to specific breeds in specific production environments over time (within year and annual variation).

**Feed Quantity** – the amount of feed generally available to the breed in specific production environments, overtime (within year and annual variation).

**Feed Quality** – the feed quality generally available to the breed in specific production environments, overtime (within year and annual variation). This includes the need to provide feed supplements as required.

**Feed Types** – the types of feed generally available to the breed in specific production environments, overtime (within year and annual variation). It also includes any specialty feed types that certain breeds can utilize or are only available in particular production environments, or geographic areas.

**4. CRITERIA - CLIMATE:** refers to the physical or meteorological environment experienced by livestock in the specified production environment.

**Indicators of Climate:** six indicators are provided for use in describing the attributes or components of this criterion, they are: temperature, humidity, precipitation, daylength, wind and radiation, for animals that are not living in climate controlled facilities. For livestock living in climate-controlled facilities, precipitation, wind and radiation measures are not required, however temperature, relative humidity and daily length of lighting are suggested as indicators.

**Indicators and Verifiers:**

**Note: In the following section, where objective data is absent or not readily available, provision has been made to accept subjective information. This is meant to allow some level of description until objective is available.**

**4.1 Temperature** – the ambient temperature measured at a nearby weather station which accurately reflect conditions within the production environment being described or are measures taken directly from within the production environment; or inside temperature measured in a climate controlled facility.

- 4.2 **Humidity** – the relevant humidity measured at a nearby weather station which accurately reflect conditions within the production environment being described or are measures taken directly from within the production environment; or inside relative humidity measured in a climate controlled facility.
- 4.3 **Precipitation** – rain and snowfall measured at a nearby weather station which accurately reflect conditions within the production environment being described or are measures taken directly from within the production environment.
- 4.4 **Daylength/daily hours or hours of lighting** – the longest day of the year or hours or hours of lighting provided for an inside production environment.

**Secondary level Indicators and Verifiers:**

- 4.5 **Wind** – wind speeds for the hottest and coldest months of the year measured at a nearby weather station or within the production environment.

**Note: Workshop participants acknowledge that radiation is an important indicator and felt that experts in this field needed to be consulted to develop verifiers. Thus, the radiation section is not complete at this time.**

- 4.6 **Radiation** – ultraviolet light expressed as a highest UV-index.

- 5. **CRITERIA TERRAIN:** is the physical surface component of a specified production environment.

**Indictors of Terrain** - three indicators are provided to define the attributes or components of this criterion, they are altitude, substrate and slope.

**Indicators and Verifiers:**

**Altitude** – elevation above sea level of the production environment - highest, lowest and mean elevations.

**Substrate** – type of substrate that generally describes the production environment. This includes man-made surfaces such as cement, wood and wire floors.

**Slope** – general description of the production environment in terms of slope or terrain steepness.