KP18
Knowledge Product 18

CCARDESA
Centre for Coordination of Agricultural Research and Development for Southern Africa

DECISION TOOL:
Climate Smart Pest & Disease Management Options for Livestock

CLIMATE SMART AGRICULTURE
KNOWLEDGE PRODUCTS FOR EXTENSION WORKERS
Customised Information Tools for Agricultural Professionals

Audience: Local Level Extension Staff (Government, NGO/Civil Society, Private Sector)

Livestock | Decision Point | Gender | Youth | Climate Smart | Practice

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WHAT IS CLIMATE SMART AGRICULTURE (CSA)?

CSA comprises three interlinked pillars, which need to be addressed to achieve the overall goals of food security and sustainable development:

1. **Productivity**: Sustainably increase productivity and incomes from agriculture, without negative impacts on the environment

2. **Adaptation/resilience**: Reduce exposure of farmers to short-term risks, while building capacity to adapt and prosper in the face of shocks and longer-term stresses (resilience). Attention is given to protecting ecosystem services, maintaining productivity and our ability to adapt to climate changes

3. **Mitigation**: Wherever and whenever possible, CSA should help to reduce and/or remove greenhouse gas (GHG) emissions. This implies that we reduce emissions for each unit of agricultural product (e.g., through decreasing use of fossil fuel, improving agricultural productivity and increasing vegetation cover).

CSA = Sustainable Agriculture + Resilience – Emissions.

How is CSA Different?

1. CSA places greater emphasis on **hazard and vulnerability assessments** and **emphasises weather forecasting** (short term) and **climate scenario modelling** (long term) in the decision-making process for new agricultural interventions

2. CSA promotes the **scaling up of approaches** that achieve **triple wins** (increase **production**, increase **resilience** and [if possible] **mitigate GHG emissions**), while at the same time **reducing poverty** and **enhancing ecosystem services**.

3. CSA promotes a systematic approach to:

   a. Identifying **best bet** opportunities for agricultural investment

   b. Contextualising **best bet** options to make them **best fit** their specific context through learning and feedback loops

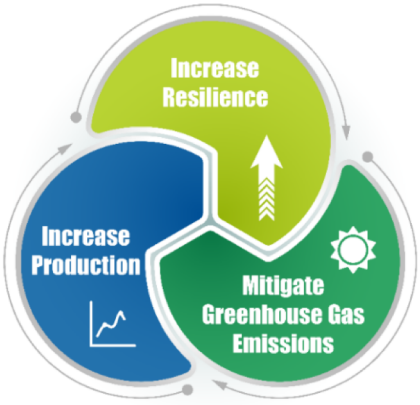
   c. Ensuring the **enabling environment** is in place so that farmers (and other stakeholders) can invest in CSA practices and technologies to catalyse adoption.

Key Messages:

1. Climate change alters the distribution, incidence and intensity of animal and plant pests and diseases
2. Climate change has enabled pests and diseases and alien invasive aquatic species, to create new ecological niches in new geographical areas – exacerbated by the movement of people, animals, plants and goods, and is the only one factor altering disease ecologies
3. To make climate smart decisions on which pest and disease management options for livestock best suit your farmers, you need to analyse:
   a. The Farming System
   b. How livestock are currently managed within the system
   c. How pests and diseases are currently identified and reported
   d. Farmers' perceptions of problems and opportunities
4. Climate smart pest and disease management options include:
   a. Biological control of vectors
   b. Producing resistant breeds
   c. Conducting vaccination campaigns.

Entry Points for CSA

- CSA practices and technologies
- CSA systems approaches
- Enabling environments for CSA.



Climate Smart Pest & Disease Management Options for Livestock

Climate change affects the distribution and prevalence of pests and diseases that are relevant in livestock production systems – especially vector-borne diseases that are expected to change their distributions. Also, animals that experience stress due to extreme climate conditions (e.g., heat, lack of fodder) are more susceptible to pest & disease outbreaks.

This Decision Tool aims to help field-level extension staff make climate smart decisions on which pest and disease management options best suit their farmers' context. This tool is not designed as a technical guide to implementation. It is designed to assist extension staff in making climate smart decisions on improvements to their farming systems with their clients/farmers. Reference to technical guides relevant to the practices and technologies outlined are included at the end of the tool. The tool focuses on some of the Best Bet Climate Smart Pest & Disease Management Options for livestock production in the Southern African Development Community (SADC) region.

They are listed in no particular order and have been selected as best bet because:

- They are climate smart (see Table 1)
- They are applicable in multiple agro-ecological zones across the region
- They have high potential to address major constraints to livestock production in the region (Table 1).

These are best bet options. An understanding of the local context and farmers' priorities is required in order to make these options Best Fit to individual farmer's needs.

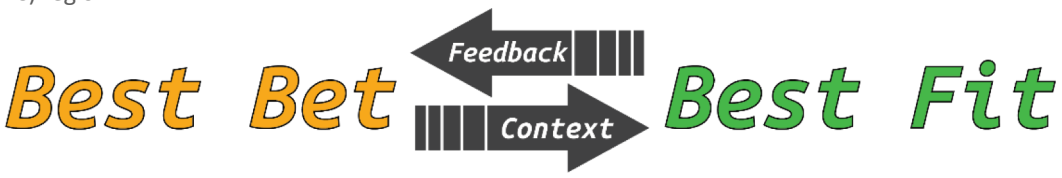


Table 1: Best Bet Climate Smart Pest & Disease Management Options for livestock for the SADC region.

Climate Smart Pest & Disease Management Option	What is it?	3 Pillars of CSA		
		Increase production	Adaptation/ resilience	Mitigate GHG emissions if possible
Biological control of vectors	Using non-chemical means to control the vectors (infectious insects, plants and/or animals) of a disease (not all diseases require vectors to spread)	Reduced incidence of disease results in healthier, more productive animals	Reduces risk of secondary infections in livestock Sale of livestock is a common coping strategy, so having more and/or better livestock to sell increases resilience	Potential for more efficient conversion of feed into meat and/or Dairy, which can reduce emissions per unit production
Producing resistant breeds	Selecting breeds that are resistant to a particular pest or disease			
Conduct vaccination campaigns	Vaccinating whole populations of livestock to ensure a disease does not enter the population			

Climate Smart Practices that target improvements in pest & disease control can result in the following benefits:

- Reduced mortality rates
- Reduced morbidity (sick) rates
- Faster animal growth rates
- Higher milk/egg/meat production
- Earlier age at first calving, lambing, foaling and/or arrowing
- Increased fertility rates
- Increased incomes
- Decreased GHG = <GHG emissions per production unit
- More efficient production.

WHICH CLIMATE SMART PEST & DISEASE MANAGEMENT OPTION IS BEST SUITED TO YOUR FARMER(S)?

To make recommendations to your farmers on the most climate smart option for pest & disease management in their livestock, you must understand the following key aspects:

- The farming system
- Reduced morbidity (sick) rates
- How pests and diseases are currently identified and reported (if necessary)
- Farmer perceptions of problems and opportunities.

A deep understanding of these elements will help you to develop Best Fit rather than just Best Bet options to improve pest and disease management.

THE FARMING SYSTEM

Farming systems are varied and complex across the SADC region. A farmer may have only one specific type of livestock as their sole source of income, or they may have several types of livestock and crops. Each part of the system may impact on another. Most smallholders will have a diverse farming system in which livestock play a key role. It is important to take the time to analyse the system – and what influences it – in detail, before selecting climate smart genetic improvement options.

The following is a checklist of questions to help you understand the farming system:

- Is the farming system pastoral, agropastoral, or something else?
- What livestock is included in the farming system(s)?
  - Does the farming system include more than one type of livestock (e.g., chickens, goats and cows)?
- When are the main cropping and grazing seasons?
  - Developing a detailed agricultural calendar is a smart way to understand changes throughout the year
- Where do farmers access agricultural inputs such as vaccinations and animal medicines?
  - Is access equal for men, women, or other subgroups?
  - What limits farmer(s) access?
- Is there a functioning Community Animal Health Worker (CAHW) or other trained veterinary officer?
  - Do farmers use their services?
  - If not, why not?
- What sources of credit are available?
  - Is credit equally accessible to all farmers (men, women, and other subgroups)?
  - What are the repayment conditions?
- Are there any agricultural projects in the target area?
  - Who are these targeting?
  - Can these projects be leveraged to help support climate smart pest and disease management?

HOW ARE LIVESTOCK CURRENTLY MANAGED WITHIN THE FARMING SYSTEM?

To make climate smart decisions on genetic improvement options, we need to understand current management practices for each type of livestock in the farming system. This includes the following:

- Livestock holdings:
  - What type of livestock, and how many are kept (age and gender should be recorded)?
  - Which breeds are kept? Record the local names and key characteristics of each breed
- Livestock housing:
  - What housing structures are provided, if any?
  - What bedding is used, if any?
  - At what times is housing used – day, night and/or seasonal changes?
  - Are animals all housed together, or are they separated by age, sex and/or species?
  - Are feeding troughs provided?
  - Where is manure collected, if at all?
- Watering points:
  - Where are the watering points?
  - Is there enough water throughout the year?
  - Who 'waters' the livestock (men, women, or children)?
  - How long does this take?
- Livestock feeding:
  - Is livestock stall-fed, tethered, open grazed, or a combination of these?
  - How does this change over the year?
  - How do feeding habits change throughout the year?
  - Does the farmer plant any fodder crops, or collect fodder for their animals?
    - » If so, at what times of year is this available?
    - » Is any of this processed; if so, how?
  - Does the farmer purchase any livestock feed?
    - » Is this equally possible for male and female farmers?
- Grazing:
  - Do the animals spend any time grazing?
  - Where do animals graze (if they do), and how long is this for?
  - What plants, residues, crops and/or trees do animals feed on?
- Sources of household income:
  - What are the main contributors to household income?
  - How much does income from each type of livestock contribute to total household income?
- Use of livestock within the farming system:
  - Why does the farmer keep each type of livestock?
    - » For own consumption and/or sale (meat, dairy, eggs, hide, wool, etc.)
    - » As a coping strategy (sale in lean periods, or during household shocks)
    - » As a status symbol
    - » As draught animals
    - » For transport
    - » For manure for crops and/or fuel
    - » A combination of reasons
- Sale of livestock and livestock products:
  - How many animals has the farmer sold over the past three years, and what were their weights (if known)?
  - How much did the farmer receive per head of livestock sold?
  - What is the overall milk and/or egg production from the farmer's animals?
  - How much did the farmer receive per litre of milk and/or number of eggs?
  - Who sells the livestock and products, and who decides upon sales and use of money (men, women or children)?
  - Were any of the sales a response to drought, or over grazing on pasture and/or rangeland?
- Labour:
  - Who performs each animal husbandry task (men, women, or children)?
  - How much time is spent on each task?
  - Do any tasks require hired labour and if so, how much does this cost?
  - Do labour requirements change throughout the year (for men, women, or children)?

IDENTIFICATION AND REPORTING OF PESTS AND DISEASES

Being able to correctly identify the main pests and diseases is crucial to making decisions on how best to manage these.

Some pests and diseases of livestock can be passed to humans. These are called zoonotic diseases

Some well-known zoonotic diseases are:

- Ebola
- Brucellosis
- Leishmaniasis
- Leptospirosis
- Anthrax
- Rabies
- Bovine tuberculosis
- Salmonellosis
- Schistosomiasis
- Trypanosomiasis.

Note: there are many more (including coronavirus/COVID-19)

These diseases can be passed to humans by contact with infected animal faecal matter, blood, meat, dairy and/or eggs, being bitten and/or infected by insects, etc. Each disease and its method of transmission is different.

Some pests and diseases can spread over huge areas causing significant production losses across multiple countries. To effectively control the spread of these diseases, it is important that every incidence is reported to the relevant authority.

Some common diseases that must be reported are summarised in Table 2.

- If you have a smartphone with internet access, you can search for images of the suspected disease and/or pest to help identify it. If in doubt, ALWAYS report it to the local Livestock Officer or Veterinarian.

- Reporting incidences of these pests and diseases is vital in the efforts to track their spread, and to be able to predict how changes in climate may affect livestock production in the future.

TIP

It is common for livestock in Southern Africa to be infected with more than one pest and disease at the same time. This can make diagnosis problematic.

Table 2: Common livestock diseases that must be reported.

Livestock	Disease name	Vector	Common symptoms
Poultry	highly pathogenic avian influenza (HPAI)	Ducks	• Usually the first sign is sudden deaths in large numbers. Combs and wattles may be swollen and purple • The legs can have red streaks – this is bleeding under the skin
Poultry	Newcastle disease (ND)	No	• Chickens stop eating, do not move around much, and may lie down • They stop laying eggs, and might have diarrhoea • Some will get a crooked neck and might become paralysed. It may look like HPAI • The only way to distinguish the two is to conduct laboratory tests

Livestock	Disease name	Vector	Common symptoms
Swine (pigs)	African swine fever	Ticks on warthogs or African bushpigs	• High fever • Skin on ears and tail is red • Pigs stop eating and huddle with each other • Dark red spots on the skin that turn into ulcers • Transmitted by ticks, which may be visible on the pig
	classical swine fever/hog cholera	No	• They have a fever and huddle together • They do not eat much, lose weight, and might have convulsions • May have crusty fluids around the eyes
Sheep & goats	peste des petits ruminants (PPR)	No	• Can result in discharge around mouth and nose, and foul-smelling diarrhoea • Crusting around nose, mouth and/or eyes
	contagious caprine pleuropneumonia (CCPP)	No	• Almost always goats, but sheep can get it too • Infected goats will have extreme fever, severe difficulty breathing, coughing and high mortality • Decreased energy, weight loss, and possible grunting and bleating • Frothy nasal discharges prior to death
	sheep pox and goat pox	No	• Multiple raised spots all over the skin • Darkened pimples under the tail and around the lips • Sheep only infect sheep, and goats only infect goats
	orf	No	• Sores on the mouth and sometimes nose; can be inside the mouth as well • Occurs primarily in sheep and goats, but humans can get it too – although it is self limiting (clears without treatment in humans)
Cattle	contagious bovine pleuropneumonia (CBPP)	No	• Animals are depressed and have runny noses • Respiratory distress and coughing • Infected animals may separate themselves from the herd
	East Coast fever	brown ear ticks	• High fever and swelling of the lymph nodes • The infected animals stop eating, have difficulty breathing and die

Livestock	Disease name	Vector	Common symptoms
Cattle, sheep & goats	heartwater	Ticks carry the bacteria (*Amblyomma* species ticks)	• High fever, depressed, and rapid breathing • Then develop nervous signs such as convulsions or crooked necks, and they die
Horses/ mules	African horse sickness	Small biting insects	• Donkeys and zebras are very resistant. Mules are less susceptible • They will have high fever with sweating, then coughing and severe problems with breathing and foaming from the nostrils before death
All cloven-hooved animals	foot-and-mouth disease (FMD)	No	• Blisters in the mouth or around the hooves are the first sign of FMD – animals get very sore feet, so they lie down or kneel • Saliva may drip from the mouth, and blisters can turn into larger lesions
Lots of species (incl. humans)	brucellosis	No	• Abortion and retention of placenta are clinical signs • Placenta with thickened areas is also typical
Cattle, goats, sheep, & humans	Rift Valley fever	Mosquitoes	• There will be abortions • Young animals may be weak, have a fever, and yellow mucous membranes
Cattle, goats, sheep, pigs, and horses	trypanosomiasis	Tsetse fly	• Intermittent fever, anaemia, and enlarged lymph nodes • Oedema (water collection on body cavities) and lacrimation (shedding tears) • Decreased fertility and abortion • Loss of appetite, body condition, and lowered productivity
All mammals (but not birds)	rabies	No	• Excessive drooling of saliva and sudden change in behavior • Progressive paralysis and ataxia (uncoordinated movements) • Abrupt cessation of lactation in dairy animals • Hypersensitivity/alertness, abnormal bellowing, and paralysis of the throat • Wild animals and herbivores become depressed, and may approach humans and appear friendly • All infected animals will die • Dangerous to humans (incudes confusion, bizarre or strange thoughts or hallucinations, convulsions, and weakness or paralysis)

Source: adapted from AU-IBAR: A field manual on Animal Diseases by Syndromes: With emphasis on transboundary diseases

Two other important pests of all livestock are worms and mange. These do not need to be reported in most contexts, but understanding which livestock have them can help manage their spread in local livestock populations.

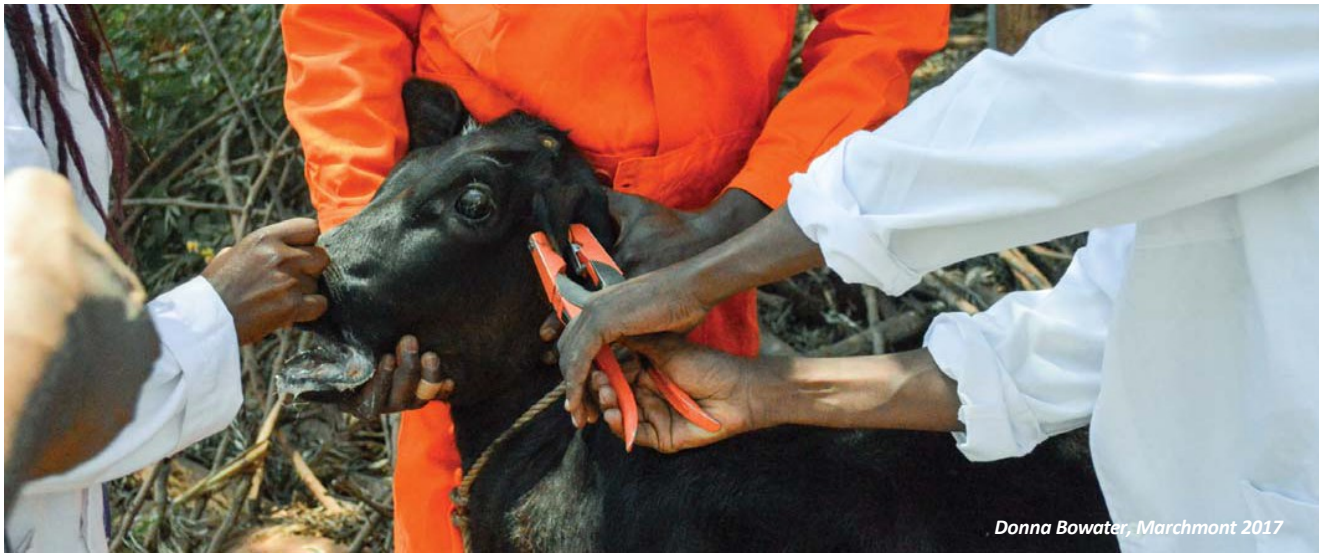
- There are numerous types of parasitic worms, and they affect all livestock.
  - Worms can cause diarrhoea, poor growth, and death. They can damage several of the internal organs, including the intestines, the liver, and the kidneys
  - Worms are picked up from the pasture when the animal feeds and then grow in the gut of the animal and cause disease; and then produce worm eggs, which are excreted in the droppings and re-contaminate the pasture
  - Low levels of worm contamination are generally not a major problem
  - Some worms require an external host (such as snails) to complete their lifecycle. Controlling these can prevent reinfection

- Mange is a skin disease that causes itching, rough skin and growth constraints.
  - Tiny mites (insects) burrow into the skin and cause itching
  - The disease is spread from affected animals to healthy animals when they contact each other.

It is vital to be able to accurately identify what disease is affecting livestock, so that climate smart control measures can be implemented. Discuss the following with your farmers:

- What are the main pests and diseases of livestock (by type) in the area?
  - Do farmers know what these diseases are, or do they identify symptoms?
  - There are manuals available that describe the most common pests and diseases of livestock in the SADC region (see Section 5: Where can I get more information?).
  - If in doubt, ask a qualified livestock health professional.

- What do farmers currently do to manage these diseases/symptoms?
  - Is this effective?
  - Are they safe?



Donna Bowater, Marchmont 2017

FARMERS' PERCEPTIONS OF PROBLEMS AND OPPORTUNITIES

To select the best fit climate smart livestock pest & disease management options for livestock with your farmers, it is always best to start by asking farmers about the main problems and opportunities that they face.

- List the major problems faced by farmers in the area, with reference to livestock production.
    - Do not limit this to pests and diseases, as systems can be complex. For example, issues in relation to grazing systems, watering points, or type of housing (if any) may affect how animals encounter each other. These may be key factors in the spread of pests and diseases
- What do farmers view as the solution to these identified problems?
    - It is always best to start with a discussion of local solutions, as these are much more likely to be adopted than external ideas.

These can then be ranked using a simple pairwise ranking tool (see Tables 3 and 4).

Once the problems and potential local solutions have been identified and ranked, spend time with your farmers – discussing the proposed solutions in more detail, and consider if other solutions the farmers have not thought about might be an option.

Remember that investing in livestock health may not be a priority for all farmers. Each household or farmer will have different priorities in terms of their farming system. It is important to understand these priorities so that effective, climate smart solutions can be proposed.

Table 3: Farmers' perceptions of problems faced in livestock production.

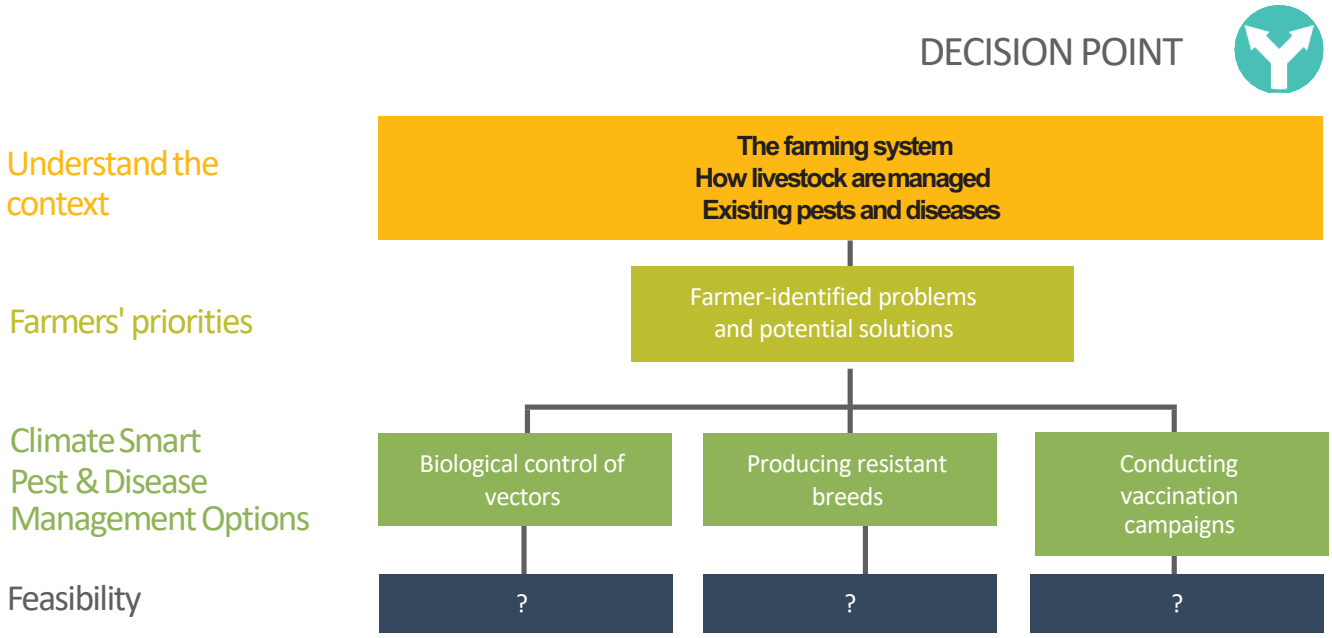
	Problem	Solution
1		
2		
3		
4		
5[1]		

[1] You can have more than five problems if you wish.

Table 4: Template for pairwise ranking of farmers' perceptions of problems faced in livestock production.

Pair	Problem Considered More Important
Problem 1 vs Problem 2	
Problem 1 vs Problem 3	
Problem 1 vs Problem 4	
Problem 1 vs Problem 5	
Problem 2 vs Problem 3	
Problem 2 vs Problem 4	
Problem 2 vs Problem 5	
Problem 3 vs Problem 4	
Problem 3 vs Problem 5	
Problem 4 vs Problem 5	

The **Decision Point** below outlines how an understanding of the context and an assessment of farmers' priorities can lead to climate smart decisions on pest & disease management options.



BEST BET PEST & DISEASE MANAGEMENT OPTIONS FOR ADDRESSING CLIMATE RISKS IN LIVESTOCK PRODUCTION

The following sections describe three climate smart pest & disease management options for livestock, listed in no particular order. All are broadly applicable across the SADC region, and in most instances a combination of options will give optimal results. While these are best bet options, they are not universally applicable. CSA is context-specific, and each of these options will need to be tested under local conditions and adapted to make them Best Fit the local context.

Before assessing the feasibility of the climate smart pest and disease management options identified, each option should be discussed in detail. Some of the options will follow as a list, but other options might also be feasible depending on the local context and the farmer's available resources.

Animals that have an adequate, superior quality and balanced diet with all the nutrients they require will be much better able to resist the attack of pests and diseases. Climate smart diet management and rangeland/pasture management are the first steps in combating pest & disease outbreaks in livestock - see CCARDESA KPs 14 & 15 in this series.

BIOLOGICAL CONTROL OF VECTORS

Vectors are insects, birds, or other animals that transmit a disease and/or pest from one host to another. The vector itself does not show symptoms of the disease. Not all pests and diseases require vectors to be transmitted. Many diseases are transmitted through the following means:

- Direct contact between animals
- Germs in feed and water
- By faeces and urine from sick animals
- By flies, ticks, lice and fleas (vectors)
- Wild animals, birds and breeds that carry disease but do not show symptoms (vectors)
- Dirty housing or shelters
- People with contaminated shoes, clothes, etc. moving between different herds and/or flocks.

Ticks and other biting insects can be controlled using different biological (non-chemical) techniques; however, it is vital that you understand the exact lifecycle of a vector before attempting any biological control.

- Long fallow periods in grazing land can ensure that ticks (for example) do not survive to re-infect livestock. This may take up to 15 months and is not always feasible
- Removal of habitat such as pools of water for mosquitos, and clearing bush for tsetse flies
- Fencing – this can control the movement of ticks from one herd, flock or wild life reservoir to another
  - This can be particularly effective in areas where wild animal vectors are present
- Introducing natural pest enemies is another option.

Ducks have been successfully used to combat liver fluke (a worm), as they eat the snails that the liver fluke develop in before infecting sheep/cattle. The worms do not infect the ducks, and the eggs die in their gut

- Pest traps, such as those used for tsetse flies
  - Riverine and savanna-based tsetse are better controlled using different trap designs
  - Traps need to be put in place as part of a large-scale control programme. Using one trap on its own is likely to have very limited, if any, effect on fly populations.

Some modern technologies are also emerging that show huge potential in controlling insect vectors in particular:

- Releasing insects, into the wild, that have been sterilised or infected with a biological control agent (parasite)
  - They breed with wild insects and help control populations
  - This is not an option a farmer can use on their own. It requires a national or sub-national campaign.

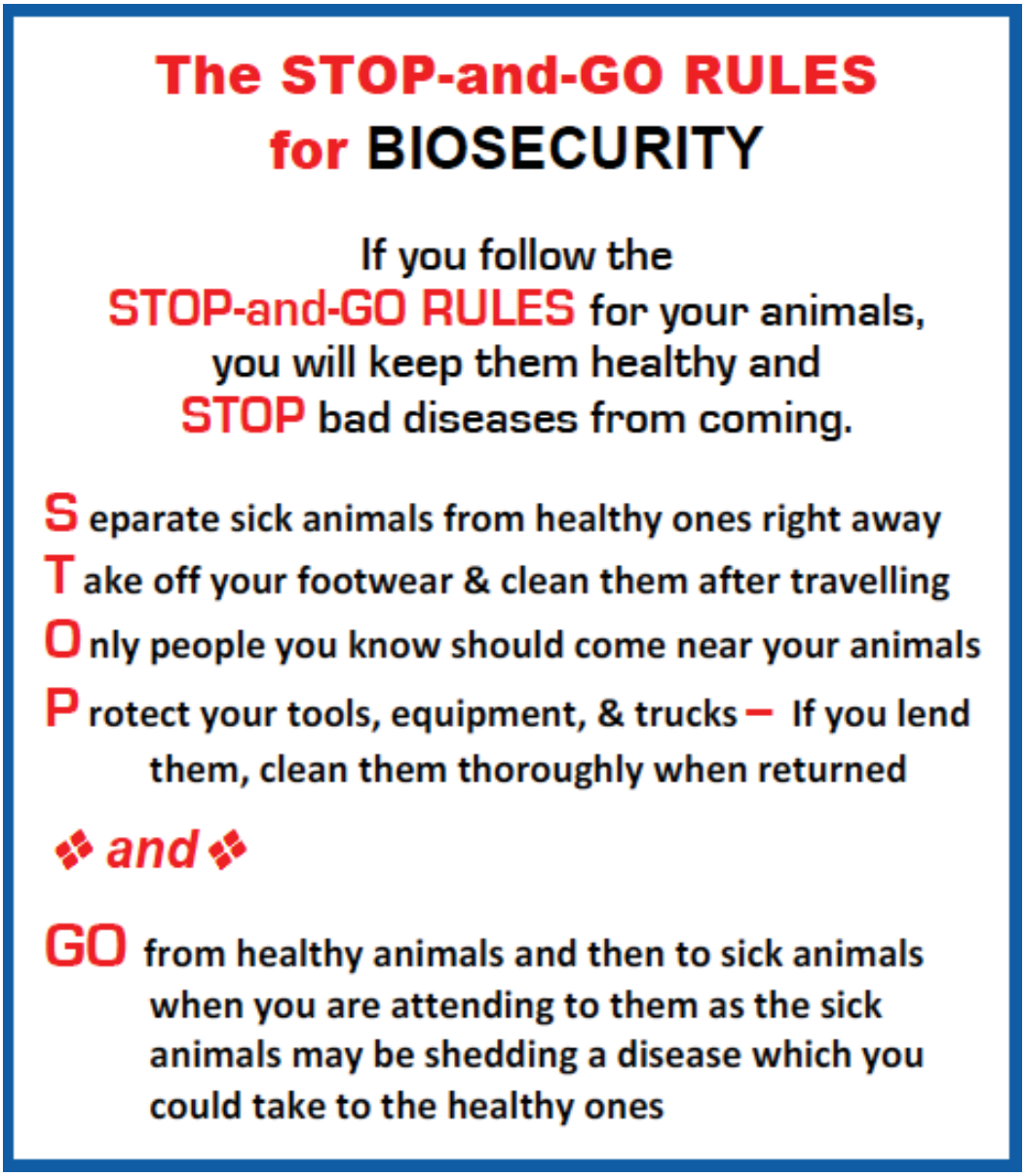
Figure 1: The Zimbabwean-made Epsilon trap for tsetse flies.

Source: www.tsetse.org

Basic biosecurity measures that should be adhered to by all livestock farmers are called the STOP-and-GO Rules (Figure 2):

Tethering, housing, fencing and kolas may or may not be a feasible option, with your farmers depending on the priority they place on livestock and on the farming system. These options will help to reduce transmission from one herd or flock to another. Note that tethering, housing, fencing and kolas may speed up transmission within the farmer's own herd or flock, if sick animals are not separated right away.

Figure 2: The STOP-and-Go rules of biosecurity that all farmers should follow.



Source: AU-IBAR: A field manual on Animal Diseases by Syndromes: With emphasis on transboundary diseases

Source: www.omafra.gov.on.ca

PRODUCING RESISTANT BREEDS

In general, indigenous breeds are more resistant or tolerant to many of the endemic pests and diseases in the SADC region. Exotic breeds may have much higher potential for productivity, but are generally more susceptible to endemic pests and diseases.
Cross breeding with indigenous breeds, or selecting only indigenous breeds, may be a more resilient option for some farmers.

When selecting breeding males in particular, unhealthy or weak males or those with undesired traits and characteristics should be castrated – leaving only the best specimens (likely the most resistant) to breed in the next season. Selection of resistant or more-tolerant breeding males is a long-term climate smart adaptation, whereas allowing uncontrolled breeding is poor practice.

Farmers should know how to detect heat in female animals, to isolate these and breed them with selected males only.

The farmer might also choose to switch from one type of livestock to another; e.g., if African swine fever is a major problem in the area, then keeping goats might be a better option.

For more on herd genetic improvements, see KP17 on Climate Smart Genetic Improvement Options for Livestock in this series.

CCAFS, 2014

CONDUCTING VACCINATION CAMPAIGNS

Vaccinations are available for some diseases and are designed to prevent any endemic livestock disease prevalent in an area:

- For vaccination campaigns to be successful, they need to be very well coordinated and timely

- Different vaccines are given at different ages of the animal. Many vaccines require a cold chain, and will only survive out of refrigeration for a few hours.
  For example: Brucellosis-4-8 months of age (Only female calves); Theileriosis-3 months of age and above; Anthrax-4 months and above.
  Vaccines such as those used for Newcastle disease in chickens (14 days or older) can be very effective because they are very low cost, and can prevent the death of significant numbers of chickens.

When deciding if a vaccination campaign is appropriate in your situation, you should consider the following steps (similar steps can be followed in a de-worming campaign):

- Situation analysis
  - Awareness of officials, veterinarians and extension workers: Is the control of the disease in the target area seen as a priority by decision makers? What information do they need to help them understand the importance of vaccinating regularly? Will existing government policies facilitate the development of a sustainable vaccination programme (e.g., on cost recovery)?
  - Farmer awareness and priorities: Do they know that a vaccine against a disease in their area might exist?
  - Quantity of vaccine: Obtain an estimate of numbers of the target livestock in the area. If farmers are to pay for the vaccine, make an estimate of the percentage of farmers likely to do so. This will enable you to order an appropriate quantity of vaccine
  - Training requirements: For reliable results, make sure that all participants in the vaccination campaign have received appropriate training. Training will vary according to the function of the individual:
    - » Veterinary services staff
    - » Extension staff
    - » Community livestock workers or community vaccinators

- Seasonality of outbreaks: When are outbreaks most likely to occur? If there is thought to be a seasonal pattern to outbreaks, ensure that the campaign starts at least one month before the outbreaks are expected.
  - » Consider if the times of the pest and disease outbreaks have been changing over the past number of years, and what might be causing this
- Agricultural and climatic calendar: Plan campaigns to coincide with times of the year when farmers are not very busy in their fields, and access to the area is possible
- Gender analysis: The campaigns will be more successful if arrangements are made with the person in the family who owns and cares for the livestock
- Cost-recovery options: Most farmers are willing to pay for a product if they believe they will get a good return on their investment. Discuss payment options with farmers, and always give them notice so that they can arrange funds prior to the campaign
- Inputs: Always make sure that you know where you can get the supplies necessary for the vaccination campaign, and that the material is in stock:
  - » Vaccine of appropriate quality and quantity
  - » Syringes and/or droppers
  - » Field allowances, if needed. Even if you plan to work with Community Livestock Workers, you will need to train and supervise them. These activities require funds, and these funds must be confirmed before you begin your activities in the field

- Preparatory Phase:
  - Appropriate extension materials. Prepare, pre-test, and duplicate the necessary extension materials
  - Training of personnel: Train personnel well in advance of the campaign. They need time to go back to their respective areas to raise farmers' awareness, collect information, and make their own preparations
  - Timing of campaign: Decide in consultation with colleagues, Community Livestock Workers and farmers. Consider weather conditions, the farmers' annual work plan, and the pattern of outbreaks
  - Start at least one month prior to the campaign with extension activities
  - Ask farmers which vaccination administration option is best for them (if there are options). Consider whether the vaccinator is to travel to individual houses, or if farmers bring their livestock to pre-arranged points
    - » What risks might be associated with bringing all livestock to one place? Is there a risk of spreading disease?
  - Procure and store inputs including vaccine, eye-droppers and/or syringes, per diems, transport, registration books, cool boxes/baskets and cloth

- Implementation – On the first day of the vaccination campaign you will have:
  - Trained teams
  - Vaccine and other inputs available
  - Decided in coordination with farmers on the site of vaccination
    - » House-to-house visits
    - » Central vaccination points
  - Registered participating farmers
  - A way of identifying vaccinated animals
  - A system in place for the vaccinator to register the number of animals vaccinated and payment received

TIP

- Commence campaigns at least one month prior to the season when outbreaks are more common
- Postpone the vaccination campaign if it is suspected that an outbreak is in progress
- Vaccinate healthy animals only
- Always inform farmers of the need to revaccinate within a given period of time
- Campaigns are best held during the weekends or school holidays
- Cost-recovery, at least partial, is essential
- Never promise protection of 100% of animals and birds
- Emphasise that the vaccine protects against a particular disease only.

- Monitoring and evaluation:

  This is an essential part of any control program.

  - Timing and frequency – The timing and frequency of monitoring visits will vary according to the position of the person(s) involved (e.g., Community Livestock Worker or Livestock Officer) and the type of monitoring being undertaken. Monitoring of activities should occur at regular intervals to enable timely adjustments as follows:
    - » One week to one month after vaccination, Community Livestock Worker confirms that animals and birds are healthy following vaccination.
    - » Three months after vaccination is an ideal time to monitor livestock numbers, farmer attitudes, and to prepare for the following campaign if vaccination is being done regularly.
  - Participatory process – In theory, all stakeholders should participate in the monitoring process. Stakeholders may include community representatives (male and female), government officials, project staff and, where relevant, consultants
  - Indicators – All stakeholders should have a say in defining the indicators of success. Possible indicators may be:
    - » Short-term changes in:

      Household animal numbers and their mortality and morbidity

      The number and types of people participating in vaccination campaigns

      The level of community involvement in campaigns

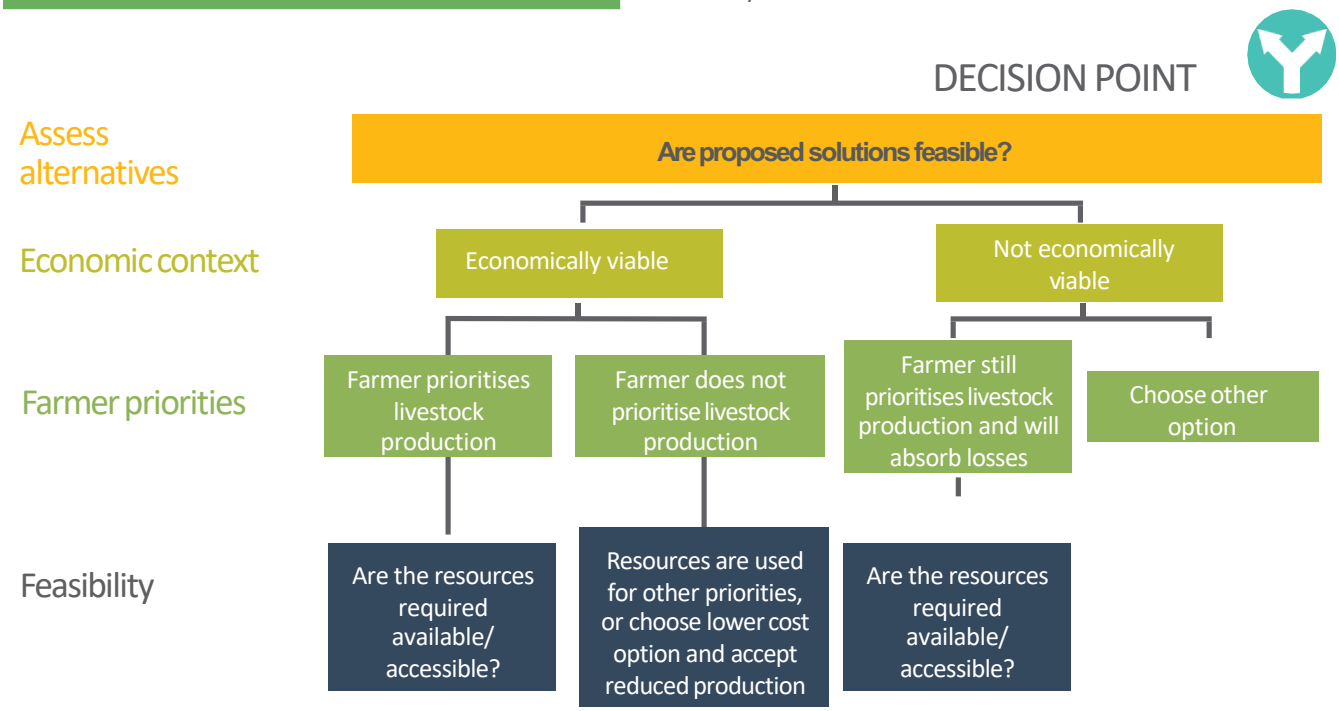
      Number of animals and birds sold or traded

      Home consumption of meat, eggs and dairy
    - » Long-term changes in:

      The number and diversity of livestock species raised.

FEASIBILITY

The **Decision Point** below outlines a decision tree that can be used to help make decisions on whether climate smart pest & disease management options identified and selected are actually feasible in the individual farmer's context.



Economic Viability

Will the costs of the climate smart pest and disease management option result in increased returns for the farmer, or are they unsustainable? In some cases, the farmer may lose out in the short term (high initial costs) but may benefit in the longer term.

Labour is a key factor that must be assessed in terms of economic viability. Farmers rarely account for the cost of own/family labour, but will consider wage labour costs. Understanding who is responsible for key livestock management tasks is critical in assessing if there are opportunity costs associated with the option proposed. Extra labour may be required to set up and monitor traps, to ensure herds do not mix, to detect females in heat, etc.

- Who will do this work?
  - Men, women, children?
- What would they be doing if they are not doing this task?
  - Will children need to miss school?
  - Will women still be able to go to market to sell milk?
  - These are known as opportunity costs and must be considered

Where livestock is being managed in an intensive system, such as dairy cows with cut and carry fodder and/or silage, it may be possible to forecast the potential costs associated with changes to more climate smart practices:

- Developing a cashflow forecast for the year
- Include labour requirements in the forecast
- Test the assumptions in the forecast:
  - Will money, labour be available when it is needed?

Throughout the year, the farmer should be supported to collect accurate data on the following key aspects:

- Inputs and costs
- Climate data, including:
  - Rainfall – duration and intensity
  - Extreme events such as droughts, heavy rain and floods (these and rainfall can affect pest outbreaks and feed availability, making animals more vulnerable to infection)
  - Heat – Excessively elevated temperatures will reduce productivity in most livestock, and may make them more susceptible to disease and pests

- Management practices, including doses of medication for pest and diseases (e.g., worm dose), communal grazing, repairs to sheds and timing
- Productivity, including litres of milk, number of eggs per day, live weight-gain, and time to reproduce
- Revenue generated during a certain time period.

This process will enable you to develop accurate gross margins at the end of the season. The farmers can use gross margins to make decisions on how to improve farming practices, to make them even smarter, so they are the best fit to their local context.

Accurate economic forecasting and analysis is not always easy as there are many factors that need to be considered. This is especially the case in more complicated farming systems, where livestock are part of agropastoral systems and there are more external factors to consider.

Discussing issues with your farmers can help identify major factors that might help you decide on economic viability at this stage. Collecting accurate data on costs incurred, production attained and externalities such as climatic conditions throughout the year and reflecting on these, will help you and your farmers make more informed decisions in the following season.

Farmer Priorities

If meat, dairy and/or egg production is a primary source of income on the farm, or livestock are a key source of draught power, pest & disease management is likely to be a higher priority as it directly affects the household economic situation. You should also consider the priorities of crop farmers who may not have livestock, or smaller numbers of them, as they may depend on the livestock products or draught power supplied by those farmers who do have livestock.

Livestock are often kept in mixed systems as a coping strategy, to be sold as cash is needed or as an investment and status symbol. In these systems, simply keeping the livestock alive may be more important to the farmer than ensuring optimum weight gain and productivity, and investing in pest & disease management may be less of a priority.

Different livestock are used for a range of purposes and may be prioritised accordingly:

- The bull or billy goat may be much more important to the farmer than calves and kids, and maintaining its productivity may come at short-term losses in productivity from other animals
- Cattle may be more important as a status symbol, while goats may be important for milk production for home consumption and sale.

Feasibility

Finally, you need to work with your farmers to assess if the preferred options are feasible in terms of accessibility and availability.

- Are the required inputs (including labour) available?
  - Where can they be sourced?
  - Will they need to be sourced regularly or once off?
  - Is credit available and affordable?
- If available, are the required inputs accessible?
  - Will the farmer be able to access the required resources?
  - Are they close by?
  - Will she or he be able to transport them?
  - Do men and women have equal access to inputs (including savings and credit)?

TO SUMMARISE

STEP 1: Analyse the context

- What is the farming system?
- How are livestock currently managed?
- What pests & diseases are prevalent and likely in the area?

STEP 2: Select 'Best Fit' options

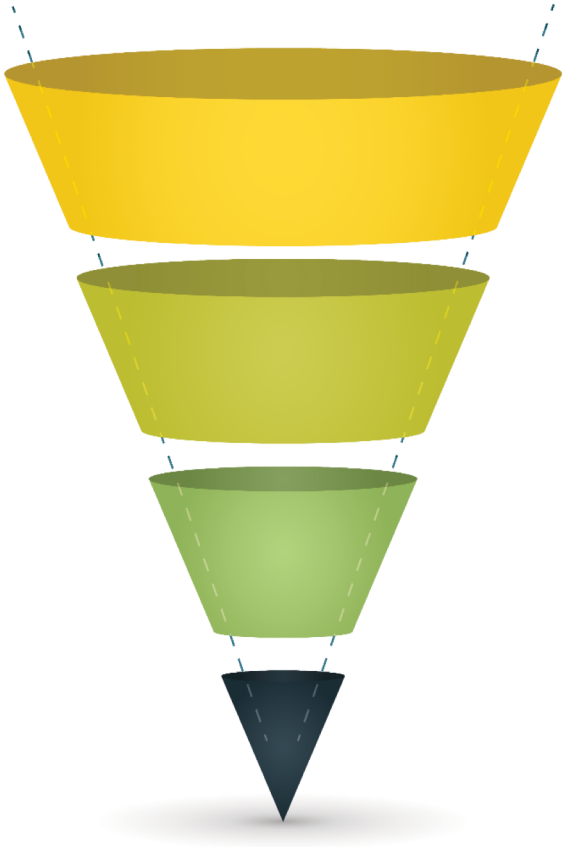
- What problems are identified by farmers?
- What local solutions are proposed?
- Are there other alternatives?

STEP 3: Assess feasibility

- Assess economic viability
- Cross-check with farmer priorities
- Are other options available?

STEP 4: Test and improve

- Try different options
- Collect data and reflect on possible improvements.



Stevie Mann, ILRI, 2014

WHERE CAN I FIND MORE INFORMATION?

The following resources, which were used as reference for the development of this Knowledge Product, provide valuable additional reading on this subject. Please also refer to the CCARDESA website (www.ccardesa.org), the full series of Knowledge Products, and associated Technical Briefs.

- The CCARDESA Knowledge Hub – KPs 14, 15, 16 and 17
- Access Agriculture – Various videos on animal health
  - Can be very useful to show to farmers. Available in multiple languages. If you sign up (free) you can download technical guides and other resources. Not all are climate smart. This is a valuable resource to return to on many topics
- African Union – Inter-African Bureau for Animal Resources (AU-IBAR) http://www.au-ibar.org/
  - The Transboundary Animal Diseases and Zoonoses Compendium for Africa, is quite scientific in nature and has limited images, but is a useful resource
- AU-IBAR – A field manual on Animal Diseases by Syndromes: With emphasis on transboundary diseases
  - A simple illustrated guide to the main transboundary diseases in the region. Highly recommended
- Australian Centre for International Agricultural Research (ACIAR) – Controlling Newcastle Disease in Village Chickens: A Field Manual
  - An excellent resource for anyone planning a vaccination campaign
- Food and Agriculture Organisation of the United Nations (FAO) – Climate Smart Agriculture: Building Resilience to Climate Change – Section IV; A Qualitative Evaluation of CSA Options in Mixed Crop-Livestock Systems in Developing Countries
  - Good background information, but not a detailed technical guide
- FAO – A Manual for the Primary Animal Health Care Worker: http://www.fao.org/docrep/t0690e/t0690e00.htm
  - A detailed resource, useful for all extension officers
- International Livestock Research Institute (ILRI) – FEAST: https://www.ilri.org/feast
  - This is a useful tool to help make decisions on livestock interventions
- Small-scale Livestock and Livelihoods Program, Malawi (SSLLP) – Training Notes for Community Animal Health Workers on Dairy Cattle, Pig Production, Village Poultry, Goats and Sheep
  - These are excellent resources targeted at community animal health workers but perfectly usable for all extension staff working with livestock. They include descriptions of pests/diseases common in each species as well as control measures and general production guidelines. Focus on Malawi, but very useful in other contexts
- Shamba Shape Up
  - Various videos and leaflets available
- Tsetse.org
  - A very useful resource if you are planning to control tsetse populations across a broad area.

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