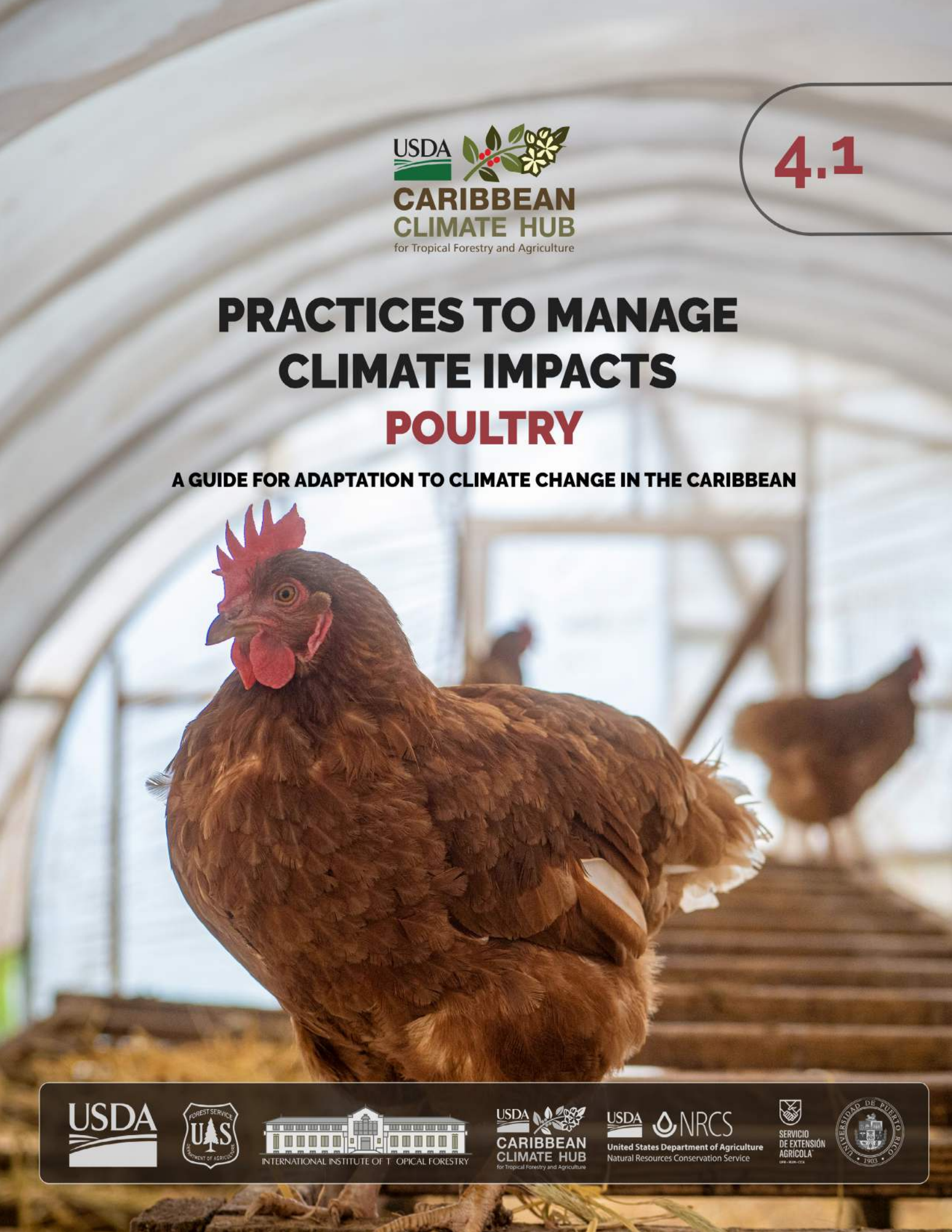
USDA CARIBBEAN CLIMATE HUB
for Tropical Forestry and Agriculture

4.1

PRACTICES TO MANAGE CLIMATE IMPACTS

POULTRY

A GUIDE FOR ADAPTATION TO CLIMATE CHANGE IN THE CARIBBEAN



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*The resources presented in this document **DO NOT:***
• Impose and/or recommend specific actions, management or public policy.
• Aim to replace experience and knowledge of the people working the land.
• Replace institutional or legal processes.

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PRACTICES TO MANAGE CLIMATE IMPACTS

in the poultry sector

CONTEXT

Rising temperatures, exacerbated by climate change, pose a significant challenge to the poultry sector (Kumar et al., 2021). The increasing frequency and intensity of heat waves are already impacting bird welfare and productivity. Heat stress negatively affects several aspects of poultry farming; from changes in feed consumption patterns to their growth rate, mortality rates, egg production, and even the ability to successfully incubate eggs (Barret et. al., 2019). Egg producers on the island of Santa Cruz have noticed a drop of up to 50% in their production due to constant heat waves (Martinez et. al., 2023). These observations and the increased susceptibility to diseases, such as *coccidiosis*, are challenges that must be taken into account when determining climate change adaptation plans.

This is why adequate poultry facilities, water management, water supply, and nutrition are some of the most important factors to consider in supporting climate adaptation in this sector (Saeed et. al. 2019). Under these extreme climatic conditions, it is crucial to help the animal dissipate body heat to regulate excessive water consumption and increase fertilization capacity, especially in poultry operations (FAO, 2013). It is also important to identify the breeds that are best adapting to the environmental conditions and management of the area.

Adaptation options depend greatly on production management goals. It is important to emphasize that byproducts generated within operations such as chicken manure can have a serious impact on the environment, polluting rivers, streams and other surface water bodies (O' Hallorans et al. 2006). It can also have a detrimental impact within production pens and on public health. However, chicken manure, with proper management, serves as an organic fertilizer to incorporate very important nutrients such as nitrogen (N), phosphorus (P) and potassium (K) for plant growth and development, erosion control and improved water retention.

Climate change adaptation in the poultry sector involves facility design and production cycle planning to adjust to the hottest months of the year. In addition, given the Caribbean context and its vulnerability to hurricanes, it is important to develop contingency plans in case of extreme rain events, drought and heat waves.

Below is a description by the USDA Caribbean Climate Hub of some conservation and adaptation practices for poultry. It is important to define the management goals in your project before implementing any practice to adress expected climate impacts in your living area. The accompanying Guide will assist you in nhe process of defining management goals in line with the climate reality of the area.

Considering that poultry farming has several sectors that have different types of breeding, it will be indicated at the bottom of each practice which sector it is most suitable for. The sectors will be divided as: a) broilers or fattening, b) layers or eggs, c) homestead or backyard birds..

> *It is important to recognize that in the case of the broiler chicken industry and the layer industry, production must meet the quality and health standards of entities such as* ***National Chicken Council y PAACO (Professional Animal Auditor Certification Organization)*** *an organization, entity that watches over and monitors animal welfare.*

INCREASING TEMPERARURES

This section presents some practices towards impacts related to increases in temperature patterns such as: extreme heat stress.

EFFECTS OR IMPLICATIONS

in the poultry sector

EXTREME HEAT STRESS REDUCES PRODUCTIVITY | Rising temperatures increase the likelihood of animals experiencing heat stress. This causes reduced meat and egg production, and even death. These increases combined with high relative humidity levels will increase the likelihood of disease spread and outbreak.

HOW CAN WE ADAPT?

Integration of trees

SILVOPASTURE

Silvopasture is a system that combines the planting of trees, grasses and raising domestic animals like birds. It provides shade and cool spaces, which reduces heat stress and improves egg or meat production. In addition, with proper management, it can increase income, if trees are used for timber are for timber or cash crops. The set of trees and grasses that grow in the area increases the diversity of food options, especially in dry seasons when there is a reduction in availability.

Other benefits:

- Carbon storage
- Soil moisture retention
- Habitat for other species and biodiversity

FORAGE BANKS OR ENERGY BANKS

This is an area on the land with high density production of grasses, shrubs, leguminous plants or species of interest for food. In grazing areas, it improves the use of the land and reduces the area dedicated to animal grazing, which can be converted into wooded space for shade or other food.

Applies to backyard chickens.

OTHER | PROGRAM OR RESOURCES

The **GUIDE 4.2 FORESTED LANDS** contains other resources and practices on integrating trees into a silvopastoral system.

NRCS | SUPPORTED PRACTICES

CODE 381 | SILVOPASTURE

Establishment or management of trees and forage in the same area for animal raising.

CODE 612 | INTEGRATION OF TREES AND SHRUBS

Establishment of woody plants by direct seeding and/or seedlings or cuttings.

CODE 548 | GRAZING LAND MECHANICAL TREATMENT

Modification of soil or plant conditions by mechanical treatments to improve planting conditions in the area.

HOW CAN WE ADAPT?

Acclimate birds to temperatures

EARLY THERMAL CONDITIONING

Exposing chickens to high temperatures (96.8 F-100.4 F) at an early age serves as a method to improve heat tolerance. Incubating eggs at higher temperatures can also improve heat tolerance of broiler chickens.

Applies to: backyard chickens, grill sector, egg sector.

Notes

HOW CAN WE ADAPT?

Establish measures for cooling structures and space

PROPER DESIGN OF THE PEN OR SHELTER AREA

Corral or barn areas should have accessible ventilation areas or ducts to regulate interior temperatures. These systems can be:

- Natural: Open spaces in favor of the wind direction
- Artificial: Use of artificial fans or ventilators

Pens can even have hybrid areas with roofs and infrastructure, as well as open-air areas to facilitate air flow if the topography and climate of the space allow it. It is important that air flow can both enter and exit the spaces.

BUFFERS OR VEGETATIVE BARRIERS

These are strips of grass, shrubs or trees that provide shade for structures, corrals and grazing areas. They also contribute to carbon storage. The species used depend on the characteristics and needs of the land.

Among the benefits of maintaining these barriers are:

- Provide shelter from strong winds and rain
- Increase shade to regulate space temperature
- Reduce summer energy cooling costs
- Minimize rainfall runoff and absorb water
- Avoid nutrient runoff from chicken manure

Applies to: backyard chickens, grill sector, egg sector.

NRCS | SUPPORTED PRACTICES

CONSERVATION INNOVATION GRANTS (CIG) PROGRAM

The program provides technical and financial support for research, evaluation, and outreach of innovative and effective conservation practices. This includes the establishment and research of heat or drought-tolerant breed varieties.

CODE 422 | HEDGEROW PLANTING

Establishment of dense vegetation in a linear design to provide food provision forpollinators. It also serves to divide spaces.

OTHER | ADDITIONAL RESOURCES

PRODUCER GRANTS - SUSTAINABLE AGRICULTURE RESEARCH AND EDUCATION GRANTS (SARE):

The program funds projects and research such as field trials, educational demonstrations, variety trials, marketing initiatives, among others, on already established farms.

Notes

CHANGES IN RAINFALL PATTERNS

This section presents some practices towards impacts related to changes in precipitation patterns such as: the proliferation of pests and diseases.

EFFECTS OR IMPLICATIONS

on the poultry sector

PROLIFERATION OF PESTS AND DISEASES | Managing humidity and runoff due to periods of extreme rainfall is important since waterlogging can be a problem for optimal meat and egg production.

DISEASES SUCH AS COCCIDIOSIS | Caused by a parasite, they can proliferate under this context.

HOW CAN WE ADAPT?

Moisture Control in Infrastructure

IMPLEMENT A SUITABLE CONCRETE FLOOR | Taking into account the physical and climatic characteristics of the terrain, in areas where there is static corral infrastructure, it facilitates the cleaning and sanitation processes. In addition, being an impermeable structure, it facilitates the cleaning of waste and prevents garbage and excess nutrients from reaching bodies of water. **Aplies to: broiler and egg sector.**

PROTECTING FLOORS WITH LITTER OR SHAVINGS

Shavings can be made from dried shells, shredded wood or other materials that absorb certain amounts of moisture and feces. Optimal health conditions can be maintained if the shavings are cleaned and changed frequently..

Some considerations when using litter:

- Keep the area ventilated to avoid excess moisture and potential growth environment for pathogens in the shavings.
- Dividing the litter into layers and removing or changing the surface layers (rather than changing the entire litter) can result in less expense and more efficient use of the litter. It should be constantly monitored and cleaned to prevent pathogen growth.
- Avoid using treated wood as shavings.
- When discarded, it can be composted for personal use or sale.

Building the floor with a slight slope towards the door prevents water stagnation and makes it easier to clean the area with a hose. Integrating ditches near the slope diverts runoff to a safe collection or storage area away from bodies of water.

Aplies for the broiler sector, egg sector, and backyard chickens.

CREATION AND INCORPORATION OF COMPOST

Compost improves soil quality, improves soil moisture retention, and reduces the need for external inputs and costs of synthetic fertilizers. These factors create a more suitable environment to keep the soil moist for longer during dry seasons. The feces of the birds can be used for compost production and to fertilize green spaces. In this way, not only are greenhouse gases captured, but it can also serve as additional income if marketed.

The chicken manure composting process must be monitored, if done incorrectly it can burn or make some crops sick.

Although poultry farming is not one of the main generators of greenhouse gases (GHG) worldwide, the accumulation of feces can emit gases such as Ammonia (NH_4) and Methane (CH_4). If they come into contact with runoff or bodies of water, they can become contaminated in different ways..
Applies to the broiler sector, egg sector, and backyard chickens.

INFILTRATION TRENCHES

The design of ditches and channels in both breeding infrastructures and grazing areas prevents water from pooling during periods of rain and high humidity. In order for the water to move, it must have a certain slope and be periodically maintained.

Applies to the broiler sector, egg sector, and backyard chickens.

NRCS | SUPPORTED PRACTICES

CODE 423 | HILLSIDE DITCH

Construction of a ditch at the bottom of the slope, developed along the contour, helps divert runoff and water to prevent erosion and damage to crops.

CODE 607 | INFILTRATION DITCH

Graduated channel on the field surface to collect and divert excess water.

CODE 317 | COMPOST STRUCTURE

Development of a plant for composting agricultural or plant material.

HOW CAN WE ADAPT?

Moisture Control in Infrastructure

MAINTAIN AN ANIMAL HEALTH PLAN

Health plans include vaccination, deworming, medication and monitoring, either by field observation or blood tests.

Vaccination and medication programs must be approved by certified veterinary service personnel.

DISEASE SURVEILLANCE MEASURES

Sick animals or showing symptoms of illness must be separated into a grazing area or quarantine facility. There they will be monitored and treated if necessary. In the event of deaths, they must undergo a treatment or elimination process.

OTHER PRACTICES FOR DISEASE OUTBREAK PREVENTION OR BIOSECURITY ACCORDING TO THE ANIMAL AND PLANT HEALTH INSPECTION SERVICE (USDA APHIS):

- Limit visitors in corrals or grazing areas.
- Keep a log of people visiting the facilities.
- Wash hands before and after coming into contact with birds or eggs.
- Provide areas for washing shoes or boots with disinfectants, keep the washing area clean constantly.
- Change clothes before entering the facilities and before leaving the farm or project.
- Clean and disinfect tools and agricultural equipment
- before moving it from one area to another.
- Install insect traps and increase pest monitoring.

Applies to backyard chickens, broiler sector, and egg sector.

NRCS | SUPPPORTED PRACTICES

CODE 316 | ANIMAL MORTALITY STRUCTURE

A facility on a farm for the treatment or disposal of animal carcasses due to routine mortality.

Notes

USDA APHIS | SUPPORTED PRACTICES

USDA APHIS | DEFEND THE FLOCK PROGRAM

Program with information on biosecurity, how to detect disease symptoms, and other resources to help poultry and egg producers.

USDA APHIS | USDA OFFERS RESOURCES FOR NEW BACKYARD POULTRY KEEPERS

Contains information on measures and considerations regarding bird diseases for backyard or small-scale producers.

HOW CAN WE ADAPT?

Strategic changes in water consumption

INTEGRATION OF NIPPLES | Nipples are a type of nozzle used to minimize water waste in the drinking area. These structures, similar to water bottles for rabbits, trigger the dispersion of water when the hen passes her tongue or applies pressure to it. This ensures that water is used only when the birds want to drink.

PROVIDE COLD WATER | Having cold, clean and constant water available (59.0F-68.0F) for the birds can reduce their consumption and body temperature.

AVOID OVERCROWDING| Providing sufficient space for each bird, whether free-range or pastured, reduces stress and body temperature in birds. Applies to backyard chickens, broiler sector, and egg sector.

DROUGHTS

This section presents some conservation and adaptation practices towards drought-related impacts such as: water rationing, food shortages and price increases.

EFFECTS OR IMPLICATIONS

on the poultry sector

WATER RATIONING | An increase in periods of drought is expected, which may result in less water availability for cleaning areas, providing water for animals and growing food for birds.

FOOD SHORTAGES AND RISING PRICES | The increase in days during dry seasons will reduce soil moisture, affecting the production of grains and other raw materials for food.

HOW CAN WE ADAPT?

Implementation of mechanisms to conserve water

Having a structure and mechanisms to conserve water is of utmost importance for the cleanliness of the spaces, as well as for the feeding and well-being of the birds. **Keeping these structures sealed will prevent the spread of diseases that may come from pets or wild animals..**

WATER COLLECTION AND STORAGE SYSTEMS

They are structures like cisterns, whose function is to store and serve as a water supply at times when there is none available for the necessary use.

Rainy seasons can be used for collection and storage. Collection water can also be used for tasks such as cleaning areas and tools to reduce operational costs.

Installing water cannals on the roofs of chicken coops or other infrastructure facilitates the collection process.

WATER EXTRACTION OR PUMPING SYSTEM

You may need a water extraction or a pumping system if the intake system cannot be operated by gravity. This applies to wells, flat areas, or structures where the intake system is at or below the area of use. This process must be done in accordance with established laws.

Applies to backyard chickens, broiler sector, and egg sector.

Notes

NRCS | SUPPORTED PRACTICES

FOR STORAGE

CODE 436 | STRUCTURE TO STORE IRRIGATION WATER

Construction of a well or tank to store irrigation water.

CODE 636 | WATER HARVESTING STRUCTURE

A structure designed to capture water that can be used for conservation purposes.

CODE 642 | WATER WELL

A hole drilled or dug, constructed into an aquifer for agricultural water supply.

FOR CONVEYANCE AND FLOW OF WATER

CODE 533 | PUMPING PLANT

Facility that that delivers water at a designed pressure and flow rate to meet livestock or irrigation needs.

CODE 558 | ROOF RUNOFF STRUCTURE

A structure or system of structures to collect, control, and convey precipitation runoff from a roof.

HOW CAN WE ADAPT?

Improving nutrition

ADD SUPPLEMENTS TO YOUR DIET WITH VITAMINS

The incorporation of nutrients and vitamins into the diet, such as mainly vitamin C and E, fat supplements, antioxidants, yeast and electrolytes, improves the production and performance of the animal.

DIVERSIFY ANIMAL CONSUMPTION

Adding agricultural by-products to vary the diet (such as cassava flour, plantain or

banana peel flour, orange peel and pulp, turmeric and cinnamon) can improve meat or egg production.

There are studies that indicate that integrating aquaculture (fish or shrimp farming) with chicken farming can be economically feasible and beneficial for adaptation. Animal breeding ponds help to lower space temperatures and serve as a source of water for bathing or drinking.

INCLUSION OF FORAGE AND LEGUMINOUS CROPS

In tropical areas, several forage species can be found with protein options for consumption. To improve the digestion process of these foods, the following processes can be applied before consuming them: fermentation, germination, husking, pelleting, soaking, heat treatments.

Hydroponically grown forage or sprouts from grasses can also improve feed quality and grow quickly.

- Having a low humidity food storage area encourages less use and expense for external food supplies.

Applies to backyard chickens, broiler sector, and egg sector.

Notes

NRCS | SUPPORTED PRACTICES

CODE 592 | FEEDING MANAGEMENT

Management and control of the quantity and quality of ingredients, nutrients, feed and additives for livestock or poultry.

CODE 511 | FORAGE HARVEST MANAGEMENT

Scheduling cutting and removal of forage for harvesting as hay, legumes, green cuttings or silage.

HOW CAN WE ADAPT?

Improve or facilitate the digestion process

PROVIDE SMALLER FOOD SIZE

Including crumbled, smaller and even moist foods facilitates digestion in birds. In times of heat stress, this provides relief to the animal.

FEED IN THE MORNING OR LATE AT NIGHT

Rainy seasons can be used for collection and storage. Collection water can also be used for tasks such as cleaning areas and tools to reduce operational costs..
Applies to backyard chickens, broiler sector, and egg sector.

SET UP LIGHTS IN THE PENS

Birds are accustomed to feeding during the day, so in order for birds to eat food during cooler hours of the night, lighting should be incorporated to help facilitate this process at night. Efficient lighting can be incorporated to reduce the temperature and costs that come from energy. **Applies to the broiler sector and egg sector.**

INCREASE IN INTENSITY OF TROPICAL STORMS

This section presents some conservation and adaptation practices towards impacts related to the increase in intensity of tropical storms.

EFFECTS OR IMPLICATIONS

on the poultry sector

LOSS OR DEATH OF CROPS AND ANIMALS AND OPERATIONAL DAMAGE | Atmospheric phenomena such as hurricanes and storms can be detrimental to the health of birds.

ACCESS AREAS OR PATHS | If these become blocked, it makes it difficult for people to access the area to feed and care for the animals. Storms with strong winds can move objects around, creating projectiles and impacting infrastructure and birds.

Notes

HOW CAN WE ADAPT?

Organize chicken and egg producers

MAINTAIN ORGANIZATION OR COMMUNICATION OF THE PRODUCERS SECTOR

During times of atmospheric phenomena, communication between producers in the region can be crucial to support tasks to restore operations.

In addition, it serves as a benefit for establishing technological innovations or best practices for adaptation, financing, production profitability, marketing and the creation of laws and public policies.

PLANNING FOR ATMOSPHERIC EVENTS

Preparing the ground before storms or hurricanes can facilitate the return to work and tasks after the event. Given the possibility of high amounts of rain and wind, it is important to consider tasks such as:

- Creating or clearing ditches and storing rainwater.
- Removing debris or materials that could become projectiles, maintaining an inventory of tools and supplies and having them properly stored.
- Keeping supplies in closed spaces with a low possibility of coming into contact with water.
- Ensuring the safety of the work personnel and maintaining contact after the event.

HOW CAN WE ADAPT?

Planning and prevention of atmospheric events

FOOD INVENTORY

Keeping track of the amount of food stored before the event makes the purchasing and preparation process easier.

PLANNING FOR ATMOSPHERIC EVENTS

Hurricanes, storms or heavy rains can affect infrastructure and access to facilities. Some tasks to facilitate work after a storm are:

- Avoid using fences in flood-prone areas or with access to bodies of water to keep animals.
- Avoid using areas where there are structures that can collapse or create projectiles.
- Use land that is accessible to work vehicles.

Applies to backyard chickens, broiler sector, and eggs sector.

CLIMATE DISASTER RELIEF FOR THE AGRICULTURAL SECTOR AND PRIVATE LANDS

USDA Farm Service Agency (FSA) and Natural Resources Conservation Service (NRCS) They have several programs that can help farmers, chicken or egg producers, and ranchers following the declaration of a disaster in Puerto Rico and the Virgin Islands.

The programs mentioned in the **GUIDE 7.3** y **GUIDE 7.4** are intended to provide guidance on financial or technical assistance available after the impact of climatic events such as hurricanes, droughts or forest fires (as determined by the Department of Agriculture). **Applies to backyard chickens, broiler sector, and egg sector.**

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