STANDARD GUIDELINES

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U.S. COTTON TRUST PROTOCOL®

CONTENTS

01: INTRO-DUCTION

1.1 VISION AND MISSION STATEMENT

The vision of U.S. Cotton Trust Protocol is to set a new standard in sustainable cotton production where total transparency is a reality and continuous improvement to reduce our environmental footprint is the central goal. The mission is to bring quantifiable and verifiable goals and measurements to the key sustainability metrics of U.S. cotton production. The core value of U.S. Cotton Trust Protocol is to commit to U.S. cotton's legacy of authenticity, innovation and excellence, environmental stewardship, caring for people, and personal and corporate integrity.

1.2 HISTORY

The U.S. Cotton Trust Protocol covers all three pillars of sustainability: environment, social, and economic. The Trust Protocol Principles and Criteria (P&C) are a critical component of all three pillars of sustainability. The P&C provides rules and guidance to growers participating in the Trust Protocol program on reaching social and environmental sustainability objectives. The P&C was developed in 2019 with the help of cotton sustainability experts, consultation from growers across the far-west, mid-south, south-east, and south-west regions of the USA, and critical friends.

1.3 THEORY OF CHANGE

A theory of change describes an organization's vision. It explains the necessary steps on how and why the desired change is expected to happen by implementing various activities and strategies. The U.S. Cotton Trust Protocol's theory of change is centered around science-based measurement and feedback from farm to fabric.

U.S. Cotton Trust Protocol's theory of change involves member and stakeholder contribution from adopting continuous improvement measures to consumption of the Protocol Equivalent Cotton (PEC) by brands and retailers, grower adoption of P&C focusing on areas like soil health, nutrient management, water management, biodiversity, crop protection, harvest preparation, preservation of fiber quality, data and traceability, farm safety and worker well-being and Trust Protocol contribution for measuring, monitoring, reporting and validating by tracking progress against the environmental indicators.

More information about U.S. Cotton Trust Protocol's theory of change can be found on the U.S. Cotton Trust Protocol website.

1.4 OBJECTIVES OF THE DOCUMENT

This document aims to assist U.S. Cotton Trust Protocol implementing partners in interpreting the P&C and explaining to U.S. cotton farmers the importance of various agronomic practices, social issues, and practical implementation of producing sustainable cotton. This document also seeks to help other audiences interested in U.S. cotton such as retailers, ginners, spinners, traders, NGOs, trade unions, and producer organizations better interpret the P&C.

To become members of the Trust Protocol, growers must meet the three criteria-to provide Fieldprint data for 10% of the total cotton production acres, fill out the self-assessment questionnaire (derived from the P&C), and commit to continuous improvement. The self-assessment questionnaire has a total of 119 questions and are catered as per cotton-growing regions (FWI – far west irrigated, SWI- southwest irrigated, SWNI- southwest not-irrigated, MSI- mid-south irrigated, MSNI- mid-south non-irrigated, SEI- south east irrigated, SENI- south east not-irrigated).

The questionnaire includes 54 required questions that the producers must comply with and 65 recommended region-based questions where the producers have the following choice for answers:

1. I am in compliance (on required questions)
2. I do now on most of my fields
3. I am implementing on one or more fields
4. I will consider in the next 3 years
5. Not appropriate for my farming operation.

The required questions are mandatory, and the producer must comply to be a part of the U.S. Cotton Trust Protocol program.

02: GUIDE-LINE FOR PRINCIPLES AND CRITERIA

2.1 PRINCIPLE 1: SOIL HEALTH

Soil is the foundation that determines our food security and sustainable water resources, so it's crucial to understand what makes good soil. Soils are also an essential component of climate change mitigation because they act as a natural buffer against emissions by absorbing and storing carbon dioxide (CO_2). Improving soil health improves crop productivity, reduces soil loss/erosion, and increases soil carbon. The Trust Protocol requires and recommends region-specific practices for improvement in soil health through its principles and criteria.

I. Criteria 1

Minimize soil erosion through mechanical and conservation practices in consideration of topography, soil type, rainfall, wind, and mechanical and conservation practices

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Utilize conservation tillage practices such as minimum, strip, mulch or no-till.	●	●	●	●	●	●	●
Prevent or alleviate soil compaction through prescribed tillage operations, controlled traffic patterns, and avoidance of traffic where soil moisture is above field capacity.	●	●	●	●	●	●	●
Use permanent and/or annual windbreaks to reduce wind erosion.	●	●	●	●	●	●	●
Construct and maintain erosion control structures such as contour terraces, catch basins, diversion channels, and grassed waterways.	●	●	●	●	●	●	●
Maintain plant residue on soil surface year-round.	●	●	●	●	●	●	●

● recommended practice, ● not applicable

II. Criteria 2

Identify areas classified as highly erodible and implement an approved Natural Resources Conservation Service (NRCS) plan as appropriate.

III. Criteria 3

In accordance with NRCS guidance, avoid planting on land converted from wetlands after 1985 and avoid conversion of new wetlands.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
If applicable, assure farm meets Conservation Compliance provisions (e.g., highly erodible land) of the U.S. Farm Law as well as any state or local requirements.	●	●	●	●	●	●	●
Work with advisors or mentors who have expertise in soil health.	●	●	●	●	●	●	●
Apply practices to minimize plant damage from wind erosion (e.g., maintain surface residue, and/or use a cover crop).	●	●	●	●	●	●	●

● recommended practice, ● required practice, ● region based recommended practice

IV. Criteria 4

Use practices known to increase soil biodiversity.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Utilize conservation tillage practices such as minimum, strip, mulch or no-till.	●	●	●	●	●	●	●
Prevent or alleviate soil compaction through prescribed tillage operations, controlled traffic patterns and avoidance of traffic where soil moisture is above field capacity.	●	●	●	●	●	●	●
Rotate cotton with other crops when economically feasible.	●	●	●	●	●	●	●
Maintain plant residue on soil surface year-round.	●	●	●	●	●	●	●
Plant cover crops with a goal to have living roots on as many months of the year as possible to protect soil and improve soil organic matter.	●	●	●	●	●	●	●

● recommended practice, ● not applicable, ● region based recommended practice

V. Criteria 5

Use soil health-building practices known to increase soil organic content, enhance soil texture, and facilitate water infiltration and soil-water holding capability.

VI. Criteria 6

Employ soil protection practices with the goal of continuous improvement to balance soil loss with soil regeneration.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Apply practices to minimize plant damage from wind erosion (e.g., maintain surface residue, and/or use a cover crop).	●	●	●	●	●	●	●
Construct and maintain erosion control structures such as contour terraces, catch basins, diversion channels and grassed waterways.	●	●	●	●	●	●	●
Rotate cotton with other crops when economically feasible.	●	●	●	●	●	●	●
Maintain plant residue on soil surface year-round.	●	●	●	●	●	●	●
Plant cover crops with a goal to have living roots on as many months of the year as possible to protect soil and improve soil organic matter.	●	●	●	●	●	●	●
Where significant changes in topography exist, orient rows along contours.	●	●	●	●	●	●	●

● recommended practice, ● not applicable, ● region based recommended practice

GUIDANCE FOR SOIL HEALTH IMPLEMENTATION

● Recommended practice

Soil health is a high priority for U.S. cotton growers as unhealthy soils can aid in environmental degradation, reduce farm productivity, and limit the quality and quantity of usable soil, ultimately leading to erosion and less land productivity. In addition, poor soil conditions can result in higher production costs and lower yields than their well-managed counterparts. Soil conservation and soil carbon are two primary components for preserving soil health. **Soil conservation** (net soil loss) is a measure of soil lost due to erosion from water and wind, and soil carbon is vital in supporting water infiltration, water and nutrient holding, crop productivity, and carbon storage.

Soil erosion can be minimized by using conservation tillage practices to preserve soil structure by keeping nutrients near the surface of the soil. Tillage practices heavily influence soil health in ways impacting both long-term productivity and environmental outcomes, such as carbon sequestration and nutrient run-off. Tillage is defined by the amount of crop residue left on the ground. Three different types of tillage are adopted in cotton cultivation across the U.S.:

a. **Conventional tillage** – incorporates most of the crop residue into the soil and has less than 15% residue cover on the ground.
b. **Reduced tillage** – residue cover on the ground is usually between 15% to 30%. It is a hybrid approach between conventional tillage and no-tillage practice
c. **No-tillage** – avoids any mechanical tillage of the soil and attempts to keep soil disturbance to an absolute minimum (one of the main principles of regenerative agriculture) and the ground residue is usually more than 30%.

Continuous reduced/no-till production practice increases the amount of soil organic matter near the soil surface. Potential benefits of soil organic matter are improved soil aggregation, enhanced structural stability, increased cation exchange capacity, and water holding capacity.

Soils with high clay content tend to erode less but are more susceptible to soil compaction. Soil compaction restricts root development, reduces soil aeration and infiltration rate damaging the soil structure. The most effective way to minimize soil compaction is to avoid field operations when soil moisture is at or near field capacity. Soil compaction will be less severe when soil tillage, fertilizer application, and planting operations occur when the field is dry.

In the southwest region of the U.S., the soil is prone to heavy wind erosion due to little precipitation and high temperatures so practices such as using permanent and/or annual windbreaks to reduce wind erosion prevent soil erosion and improve the soil carbon. The windbreak's primary purpose, also called shelterbelts, is to slow the wind, but they are not a one size fits all practice. The location, orientation to the wind, height, width, density, and species selection all play a role in determining the windbreak's benefits. In addition, contour terraces, catch basins, diversion channels and grassed waterways also help to control erosion in all the cotton-growing regions. Where significant changes in topography exist, orienting rows along the contour helps to conserve rainwater and reduce soil losses from surface erosion. Orienting rows along the contour is a traditional approach. Significant changes to topography refer to the rise or fall of the elevation of the Earth's surface through time.

Maintaining plant residue on soil surface year-round to protect the soil surface not only from water erosion but also from high winds by reducing soil evaporation, keeps soil structure in place, reducing soil crusting, and promoting a good soil environment. This practice is not recommended to southwest regions as predominantly the soil types are sand or loam soil mixtures, with sandy loam being the most common being prone to heavy wind erosion.

With wind erosion, prevention is far more effective than cure (emergency treatments once wind erosion occurs). Standing vegetation (attached residues) should cover the soil surface in heavy wind soil erosion regions throughout the year. Combined with no-till between the rows of standing residue, it keeps the wind off the soil surface. Specific areas are prone to high winds, especially in the Texas panhandle and south plains area, and growers use sand-fighters, a tillage tool that creates dirt clods to resist wind-blown soil erosion.

Another practice to reduce soil erosion is to plant a cover crop. The protective canopy minimizes the impact of raindrops on the soil surface, decreasing soil aggregate breakdown and covering the soil surface like standing vegetation. The cover crop approach dramatically reduces soil erosion and runoff, increasing infiltration. Planting cover crops if sufficient irrigation water and/or soil moisture is available (valid for far west and southwest irrigated regions), if adequate soil moisture is available (valid for non-irrigated regions), is recommended. Having living roots as many months of the year as possible to protect soil and improve soil organic matter (valid for mid-south and southeast irrigated regions) also significantly improves soil health. Cover crops use sunlight and carbon dioxide to make carbon-based molecules (like all the plants). This process causes a buildup of carbon in the soil, and most of the carbon is rapidly cycled through the many organisms in the soil, but some eventually become humic substances that can gradually build soil organic matter[1]. Many cover crops are also region-specific and these limit choosing the correct type of cover crop for individual farms as there is no universal solution in farming.

When economically feasible, rotating cotton with other crops also escalates the soil carbon cycle. Crop rotation refers to cultivating different crops on a particular piece of land over time. The exact crop rotation sequence depends a lot on the local environmental and economic circumstances. It helps improve soil biodiversity by changing crop residue and rooting patterns. A range of crops will lead to a more diverse and healthy microbial community, and different crop species benefit specific microbial groups. Customized approaches for individual fields and farms that prevent erosion and increase soil carbon can be consulted with advisors and mentors of soil health practices. Working with advisors and mentors helps growers explore soil health practices' economic and environmental benefits and risks with recommendations on implementing region-based approaches more efficiently.

● Required practice

The U.S. Cotton Trust Protocol requires grower members to assure their farm meets **Conservation Compliance** provisions (e.g., highly erodible land) of the U.S. Farm Law as well as any state or local requirements. Highly erodible land (HEL) can erode at an excessive rate from either water or wind because of soil properties, leading to long-term decreased productivity. HEL is designated by field and based on the proportion of the total acreage that contains highly erodible soils. It would include soils that have an erodibility index of eight or more. Suppose a producer has a field identified as highly erodible land–In that case, that producer is required to maintain a conservation system of practices that keeps erosion rates at a substantial reduction of soil loss.

[1] Sustainable Agriculture Research and Education, **10 Ways Cover Crops Enhance Soil Health**

PRINCIPLE 2: NUTRIENT MANAGEMENT

Nutrient management involves the practice of increasing nutrient use efficiency while decreasing nutrient loss by adopting various conservation practices. Trust Protocol grower members leverage modern farming techniques from precision agriculture to 4R (Right rate, right time, right place, right source) principles for nutrient application through the following criteria:

I. Criteria 1:

Maintain a nutrient management plan to:

d. **Enhance soil fertility**

e. **Continuously improving nutrient cycling**

f. **Monitor soil nutrients and pH**

g. **Replace nutrients based on the amount removed by previous crop harvests**

h. **Apply precise nutrient amounts to avoid over-application**

i. **Apply nutrients from appropriate sources**

j. **Time nutrient applications as close to the crop needs as possible**

k. **Place nutrients in appropriate proximity to roots to be readily available for plant uptake**

l. **When using animal manure pay special attention to the ratios of primary nutrients to avoid excess phosphorous or potassium which could be a cause of eutrophication**

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Have a nutrient management plan that considers soil type, soil pH, related local conditions while avoiding excess fertilization and conducting soil tests as appropriate for nutrients and micronutrients.	●	●	●	●	●	●	●
Conduct soil test to determine residual Nitrogen (N), Phosphorus (P)& Potassium (K) and micronutrients and apply only recommended amounts to meet attainable productivity targets.	●	●	●	●	●	●	●
Monitor plant nutrition needs by in-season tissue testing, such as petiole monitoring.	●	●	●	●	●	●	●
Test animal wastes and manure used for fertilizer for nutrient content, and match rate applied to crop needs.	●	●	●	●	●	●	●
Check and comply with local regulations when applying manure.	●	●	●	●	●	●	●
Keep records of application dates, materials, and rates to track efficiency and identify opportunities for improvement.	●	●	●	●	●	●	●
Consider soil types when selecting fertilizer sources.	●	●	●	●	●	●	●
Apply fertilizer as close to time of crop need as possible.	●	●	●	●	●	●	●
Use GPS or other precision application tools, such as variable rate application systems where nutrient and soil variations warrant.	●	●	●	●	●	●	●

● recommended practice, ● required practice

II. Criteria 2

Use application practices that minimize nutrient runoff into water bodies.

III. Criteria 3

Use appropriate storage of fertilizers including manure to prevent leaching and runoff.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Work with an agronomist or other qualified expert with training in nutrient management to improve run-off water quality.	●	●	●	●	●	●	●
Monitor plant nutrition needs by in-season tissue testing, such as petiole monitoring.	●	●	●	●	●	●	●
Check and comply with local regulations when applying manure.	●	●	●	●	●	●	●

● recommended practice, ● required practice

GUIDANCE FOR NUTRIENT MANAGMENT IMPLEMENTATION

● Recommended practice

Much of the greenhouse gas (GHG) emissions are attributed to nitrous oxide emissions from soil that comes from the application of fertilizers. Having a **nutrient management plan** can help reduce the GHG emissions. Higher cotton yields, enhanced fiber quality, increased water and fertilizer usage efficiency, and more profitability can all be credited to good nutrient management. Producers and the environment both pay a price for excessive fertilizing. It's also bad for the crop, as it delays maturity and makes it more vulnerable to insect pests and illnesses. A solid soil management plan should be based on a combination of soil and plant analysis, field history, and experience, and should strive to determine the quantity and timing of accessible nutrients.

Applying fertilizer as close to the time of crop need as possible, planning for fertilizer nutrients to be available during crop demand, and many times this is close to planting considering the weather and seasonal conditions. During the winter there are more chances of nutrient runoff and application of fertilizer before a large rainfall could contribute to nutrient runoff. Out of the 4R principles of fertilizer application, the right time helps in making nutrients available when needed by the crop[2]. The 4R's stand for right source, right rate, right time, and right place and serve to guide farmers to the management practices that help keep nutrients on and in the field. Implementation of the 4R's helps to align the economic, environmental, and social components of nutrient management.

Conducting soil testing to determine residual N(nitrogen), P(phosphorus) & K (potassium), and micronutrients and applying only recommended amounts to meet attainable productivity targets is an efficient nutrient management plan. The right application rate matches the quantity of fertilizer type of crop needs. A soil analysis is the best way to appropriately match the amount of fertilizer needed for crops based on individual field fertility.

Nitrogen is essential for both vegetative and reproductive growth; however, uptake is limited early in the season until the first bloom. Excess nitrogen in cotton results in delayed boll opening, leading to shorter fibers, thereby decreasing yield and quality, especially in shorter growing regions like Southern High Plains. Phosphorus is essential for the photosynthesis process, especially during the opening and closing of guard cells in the

[2] Nutrient Stewardship, What are the 4Rs

stomata region of the cell. Excess phosphorus can lead to decreased dissolved oxygen levels, leading to eutrophication. In general, only 20-30% of the applied P-fertilizer is used by the crop in the application year, and the remaining P will be bound up in the soil and may be used later. Potassium is also an essential nutrient in cotton production. The cotton bolls are a significant sink for potassium as it helps in maintaining sufficient water pressure within the boll for fiber elongation. Excessive or shortage of potassium results in decreasing fiber quality.

When selecting fertilizer sources, soil types are key for the integrated nutrient management plan. For choosing the right sources, a few considerations are whether the fertilizer nutrients being used are available for immediate or delayed crop uptake, a combination of fertilizers that can be utilized best based on the nutrients readily available in the soil. For example, sandy soils are more prone to leaching than fine-textured clay soils that are rich in organic matter. Fertilizers containing slow-release nitrogen work the best for plantings mostly in sandy soils compared to fine-textured clay soil. Most fertilizer applications in irrigated regions are done by mixing fertilizer (primarily liquid) with irrigation water. There are many variables when choosing the right source, such as temperature fluctuations. Under high temperatures, choosing based on degree and speed of solubility is a significant limitation, and under low temperatures, fertilizers may precipitate out of solution when added to hard water. Monitoring plant nutrition needs by in-season tissue testing, such as petiole monitoring, is critical for an integrated nutrient management plan. In-season nutrient applications boost plant growth and protect yield against various environmental stresses. Tissue testing indicates nutrient levels within the plant at that growth stage and helps remediate any nutrient deficiencies.

Using GPS or other precision application tools, such as variable rate application systems where nutrient and soil variations warrant, are a very essential component of the integrated nutrient management plan. The right placement of fertilizers can keep nutrients where they can be of most use to crops. Fertilizers using precision application tools and GPS are merely applied where and when they are essential and within the needed quantities for each zone. Each field has individual management practices based on a crop being grown, soil type, slope, distance to surface waters, soil structure, and characteristics. Variable-rate applications help in managing the within-field variability using satellite information, sensor information (tractor mounted or drones), and manual observations and registrations.

Testing animal wastes and manure used for fertilizer for nutrient content, and matching rate applied to crop needs is also an essential component of the integrated nutrient management plan. Animal wastes such as chicken and cow manure have been used for centuries as fertilizers for farming. However, manure doesn't always contain as many nutrients as fertilizer. It is mainly based on an animal's diet, and can only be created when they lay waste. The Trust Protocol recommends grower members test the animal wastes and manure contents to match the crop needs before applying to avoid excessive wastage that could result in an increase in methane production resulting in GHG emissions.

The program also suggests keeping records of application dates, materials, and rates to track efficiency and identify opportunities for improvement. Good record-keeping helps with planning and realistic forecasting. Accurate records will enable growers to buy the correct amount required for each growing season, also tracking success if a fertilizer application achieved the best results or why a fertilizer may have performed poorly. Good record keeping prevents future failures. Working with agronomists or other qualified experts with training in nutrient management to improve run-off water quality can help understand what needs improvement and the best path forward. They also help in creating an optimization plan for using minimum resources to get maximization of output. Agronomists serve as a bridge in bringing the latest advances between technology and Trust Protoco grower members They understand the dynamics of crop production from every inch of soil to practices that can minimize nutrient runoff into water bodies.

Required practice

The Trust Protocol requires having a **nutrient management plan** that considers soil type, soil pH, related local conditions while avoiding excess fertilization, and conducting soil tests for nutrients and micronutrients across all regions.

Checking and complying with local regulations when applying manure is vital as a requirement for the Trust Protocol program. Manures and fertilizers are paramount for efficient crop production. Manure must be carefully stored and managed to prevent under or over application as under application can lead to inadequate crop growth because of lack of nutrients. Over application can reduce crop quality and increase the risk of plant disease, increasing the risk of contaminating surface or groundwater.

PRINCIPLE 3: WATER MANAGEMENT

Water management contributes to increasing water use efficiency for the sustainable production of cotton. With the inherent longer taproot system and being a glycophytic, cotton can handle abiotic stress like water-deficient much better than any other crop species. To maintain optimal production and yield, water management strategies are the most important way to improve agricultural water use. The Trust Protocol requires and recommends practices for better water management through the following criteria:

I. Criteria 1

Maintain a water management plan to:

a. **Employ practices that maximize efficient use of natural rainfall**

b. **Employ soil health-building principles that increase soil organic content and optimize soil water holding capacity**

c. **Where supplemental irrigation is needed, use efficiently, and calibrate corresponding to crop needs**

d. **Schedule irrigation timing in accordance with crop physiological needs.**

e. **Promote measures to minimize runoff and impacts to water resources from sediment, agricultural chemicals, manure, and other fertilizers**

f. **Measure amount of water used**

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Conserve and utilize natural rainfall and/or tail water through use of cover crops, terraces, holding ponds, reservoirs or conservation tillage.	●	●	●	●	●	●	●
Utilize irrigation strategies which complement overall management of crop, pests and harvest date.	●	●	●	●	●	●	●
Utilize variable rate irrigation (VRI) on fields with known spatial variability in soil types, topography, and/or non-crop areas.	●	●	●	●	●	●	●
Utilize flow meters to measure water use.	●	●	●	●	●	●	●
Use soil, climate, or plant-based measurements such as moisture probes or potential evapotranspiration (PET) data to monitor soil and crop water status.	●	●	●	●	●	●	●
Keep records of application dates, materials and rates to track efficiency and identify opportunities for improvement.	●	●	●	●	●	●	●
Use riparian buffer when water features are present.	●	●	●	●	●	●	●
Install and maintain filter strip/buffer strips/ field borders.	●	●	●	●	●	●	●
Install and maintain grass waterways where applicable.	●	●	●	●	●	●	●
Install and maintain sediment control basin.	●	●	●	●	●	●	●
Implement stream habitat improvement for native species.	●	●	●	●	●	●	●

● recommended practice, ● not applicable, ● region based recommended practice

II. Criteria 2

Manage water resources in accordance with local authorities.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
On installation of new wells or existing wells (where applicable), comply with local and state requirements including licensing if appropriate.	●	●	●	●	●	●	●

● required practice, ● not applicable

GUIDANCE FOR WATER MANAGEMENT IMPLEMENTATION

● Recommended practice

Cotton's water requirement is determined by the location and environment where it is being grown. The dryer and hotter the environment, the more water the plant requires. A desert-like climate with high temperatures and low humidity will increase water requirements ranging from 40 to 50 inches of water per year. A more humid and temperate environment often results in lower water requirements anywhere between 20 to 30 inches. Cotton is a drought-tolerant crop, and in many parts of the Cotton Belt where summer precipitation is adequate, it can be grown without supplemental irrigation. In more arid regions, where irrigation is required to make the crop, growers have several application methods to choose from depending on their location and the cultural methods available.

The most common irrigation method is flood irrigation, where water is diverted down furrows, or the entire surface area is flooded. Other methods include sprinklers and subsurface drip systems. Low-pressure drip irrigation systems can provide an economical alternative to traditional subsurface drip and conventional irrigation systems. Water quantity, quality, and drainage are essential considerations in determining the best method to irrigate cotton. In some regions and years, having the ability to remove or drain surface water from fields is as essential to maintaining high yield and fiber quality as adding water through irrigation. In arid regions where water quantity and availability are limited, more reliance on sprinkler and drip irrigation systems are utilized.

Having an adequate moisture supply is critical to establishing and maintaining high yield and quality potential. Avoiding water-deficit stress, beginning at first square, is critical to establishing adequate plant structure and fruiting forms to set high yield and quality potentials, especially with early-maturing varieties grown in locations with a limited season. Moisture stress resulting from the lack of or excess water early in the growing season will restrict root and crop development. Cotton is susceptible to moisture stress (deficit) just prior to and during squaring through the end of the effective flowering window. Abrupt changes in soil moisture will adversely affect growth and cause fruit shed.

The Trust Protocol recommends that grower members use region-specific practices, and the majority of water management plans are only for irrigated growers. In far-west regions, the Trust Protocol suggests grower members conserve rainfall through conservation tillage, in mid-south and south-east areas, the use of cover crops, terraces (soil conservation practice applied to prevent rainfall-runoff on sloping land), ponds, or reservoirs with conservation tillage can help in preserving natural rainfall and in the southwest, regions use of terraces, furrow diking (small earthen dams formed periodically between the ridges of a ridge-furrow tillage system) or conservation tillage can help in conserving natural rainfall.

Implementing stream habitat improvement for native species and installing sediment control basin are vital for water management. However, this practice only limits to mid-south and south-east region grower members as the majority of rivers leading to streams are present in that area of cotton belt. Stream habitat improvement involves maintenance or restoration of physical, chemical, and biological functions of a stream and its associated riparian zone. Stream habitat improvement helps in retaining sediments and excessive run-off nutrients such as fertilizer and prevents them from traveling further downstream where they can cause dead zones or algae blooms.

Installing and maintaining filter strips/ buffer strips/field borders across the Cotton Belt is one of the components of water management plan. A filter strip is an area of grass or permanent vegetation used to reduce sediment, nutrients, and any other contaminants from runoff to maintain and improve water quality. Field borders can also offer buffers to mitigate pesticide drift during pesticide applications and pollen drift where the mixing of plant varieties is not desired. Extended field borders provide more surface area to filter out sediments, agrochemicals, and waterborne

pathogens. Wildlife species utilize transition zones between agricultural fields because they offer a unique cover combination and provide essential travel corridors. Field borders are often adjacent to riparian areas and are critical for contributing clean water and nearby habitat areas. Extending existing field borders enhances wildlife habitat and increases the effectiveness of water quality protection if the border is next to a stream. In addition to filter strip installing and maintaining grass waterways where applicable can also contribute positively to water management. Grassed waterways are areas planted with grass or other permanent vegetative covers where water usually concentrates as it runs off a field. Grass in the waterway can be either natural or man-made and it can slow down the water runoff preventing erosion.

Using riparian buffers when water features are present is a native way of controlling soil erosion by stabilizing soil with their roots and acting as a physical barrier to reduce overland water flows. Riparian buffers are a similar concept to a filter strip/buffer except that instead of grass, trees are used to plant along a stream corridor to prevent erosion and aid in filtering run-off to prevent contaminants getting into water channels. Riparian buffers can be created by enhancing forests and other natural vegetated areas along perennial streams.

Using soil, climate, or plant-based measurements such as moisture probes or potential evapotranspiration data to monitor soil and crop water status can be beneficial. Soil moisture sensors or moisture probes estimate the amount of water in soil. They can help measure moisture accurately in any type of soil with minimum disturbance and give the moisture percent data. Knowing the moisture percentage allows the need for irrigation to be quantified in advance and enables efficiency by eliminating wasteful use of water when irrigation is not needed.

Utilizing flow meters or canal structures to measure water use increases the water use efficiency. Flow meters are high-precision instruments that accurately measure the velocity of water or volumetric flow rate of water. A flow meter is a valuable tool for improving irrigation efficiency, evaluating current management practices, determining pump efficiency, and detecting well pump and irrigation system problems. Flow meters are a useful tool to help understand water use and pump performance in agriculture. This practice is a region-based approach only. Due to lack of canals in southeast and mid-south areas only utilizing flow meters is recommended.

Variable rate irrigation (VRI) on fields with known spatial variability in soil types, topography, and/or non-crop areas helps in efficient water management systems. VRI uses GPS and GIS technology to prescribe a specific amount of water for certain areas of the field. One of the significant limitations of VRI is its cost of installation and operations. VRI can conserve water by applying less water to areas of the field where the crops are getting water from other sources. This may be either a high-water table, or an area where water is ponding in the field due to runoff from sub-optimal operation of the pivot, or from water running onto the field from outside sources. Watering these areas less can reduce over-irrigation, saturation of soils, losses of nitrates through leaching, and losses of yield due to waterlogging.

Applying irrigation strategies which complement overall management of crop, pests and harvest date is the basic guideline for an integrated water management plan. Strategies such as adopting cotton varieties that are best adapted to the region's current and forecasted climatic conditions and soil characteristics are also crucial for the integrated water management plan. Using local guidelines for irrigation scheduling is recommended as the foundation for making important decisions for initiating, scheduling and terminating irrigation.

Irrigation initiation and termination decisions are challenging and can significantly impact yield and quality positively or negatively. Irrigation scheduling guidelines often include criteria based on the soil moisture as a result of actual measurements. More subjective soil moisture evaluations can be derived from the look and feel of the soil. Observations of the cotton plant will reveal that a change in leaf color toward

a slight bluish tinge occurs before wilting. In the drier spots in the field, the color appears somewhat darker than the remainder of the field. These spots can be used year to year as a diagnostic indicator to initiate irrigation. However, these spots don't often provide a great deal of advanced warning that yield limiting moisture stress is imminent. Bookkeeping methods are utilized to keep a running inventory of plant available water by adding effective rainfall and irrigation to account for water entering the soil profile and subtracting soil water losses. Plant water use based on daily high and low temperatures and estimated evapotranspiration rates is determined by crop growth and other factors accounting for water leaving the soil profile. Computer programs allow producers to input data from various measurements to schedule irrigation based on plant, soil and environmental data generally collected onsite.

● Required practice

The Trust Protocol mandates grower members comply with local and state requirements including licensing if appropriate on installation of new wells or existing wells (where applicable). Usually, local and state ecology officials regulate well construction to ensure safe water and protect water resources. Geologic conditions vary significantly across the cotton belt as a result the well requirements like depth, construction, water quality also differ widely. This practice is only required for irrigated growers.

PRINCIPLE 4: CROP PROTECTION

The crop protection principle aims to protect cotton plants from harmful pests and minimize worker and environmental exposure to pesticides using the following criteria

I. Criteria 1

Use an integrated pest management (IPM) plan representing the best knowledge available that includes:

A. Maximizing natural pest control with prevention practices such as:

a. **Cultural practices and traps**
b. **Historic pest information**
c. **Lifecycle understanding of pest**
d. **Monitoring**
e. **Natural pesticides where available and**
f. **Host plant pest resistance**

B. Use of pesticides when pest damage/numbers require action based on university threshold guidelines.

C. Use only pesticides that have been fully evaluated and approved in accordance with science-based assessment and risk-based approvals by the U.S. Environmental Protection Agency (EPA) conducted in consultation with National Marine Fisheries Services, National Fish and Wildlife Service, U.S. Food And Drug Administration (FDA), and U.S. Department Of Agriculture (USDA).

D. Use only pesticides approved for use on cotton in the U.S.

E. Observe use restrictions and risk mitigation measures as required by law on labels of each active ingredient

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
If applicable, destroy stalks to eliminate, reduce or prevent overwintering insect and disease pests in keeping with local or regional conditions and regulations.	●	●	●	●	●	●	●
Use qualified consultants or certified crop consultants to monitor crop and pest status and make recommendations for management.	●	●	●	●	●	●	●
Use plant-based measurements to help determine economic thresholds (e.g., square and/or boll retention).	●	●	●	●	●	●	●
Use science-based action thresholds to initiate insecticide treatments.	●	●	●	●	●	●	●
Monitor for pesticide resistant pests and follow recommended guidelines for resistance management.	●	●	●	●	●	●	●
Use production practices that promote healthy stands such as appropriate date of planting, optimum soil temperatures, appropriate seeding rate, seed vitality and seedbed preparation.	●	●	●	●	●	●	●
Inspect and keep annual records of fields and weed, insect, disease pressure.	●	●	●	●	●	●	●
Inspect and document fields in spring and fall for weed species and density to select appropriate weed strategy.	●	●	●	●	●	●	●
Manage weed seed bank by spot-applying post-emergence and layby herbicides or hand-rogue sporadic infestations to prevent seed buildup.	●	●	●	●	●	●	●
Maximize control provided by naturally occurring or released parasites, predators and pathogens by avoiding unnecessary insecticide applications and selecting least disruptive materials.	●	●	●	●	●	●	●
Participate in community-wide and area-wide approaches to pest management, such as containment and eradication involving resistant invasive or non-native pests.	●	●	●	●	●	●	●

● recommended practice, ● required practice, ● not applicable

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Use only crop protection materials registered and approved by EPA and state regulators.	●	●	●	●	●	●	●
Follow label and use directions of crop protection products, and only on the crops specified.	●	●	●	●	●	●	●
When required for a specific restricted use pesticide, including highly hazardous pesticides, employ closed application and delivery systems and product-specific mitigation as mandated on label, to prevent exposure of workers and operators, spills and environmental exposure.	●	●	●	●	●	●	●
Use science-based action thresholds to initiate insecticide treatments.	●	●	●	●	●	●	●

● recommended practice, ● required practice

II. Criteria 2

Protect all workers on the farm by ensuring workers annually attend, complete, and obtain verification documents of compliance to EPA Worker Protection Standards for pesticide safety training.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Provide regular employee educational programs dealing with farm safety, pesticide handling and on-farm environmental concerns.	●	●	●	●	●	●	●
Comply with regulations applicable to agricultural operations under the Occupational Safety and Health Act as well as EPA worker protection standards and other appropriate regulations.	●	●	●	●	●	●	●
Communicate information to employees on hazardous chemicals through labels, safety data sheets (SDS), and training programs as well as a written hazardous communication program and recordkeeping.	●	●	●	●	●	●	●

● required practice

III. Criteria 3

Ensure pesticide handlers and applicators complete additional required training and certification, including product specific training.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Comply with Worker Protection Standard regarding protective clothing, posting, restricted re-entry intervals, and training.	●	●	●	●	●	●	●
Maintain required training and certification of pesticide applicators consistent with current requirements.	●	●	●	●	●	●	●
When required for a specific restricted use pesticide, including highly hazardous pesticides, employ closed application and delivery systems and product-specific mitigation as mandated on label, to prevent exposure of workers and operators, spills and environmental exposure.	●	●	●	●	●	●	●
Communicate information to employees on hazardous chemicals through labels, safety data sheets (SDS), and training programs as well as a written hazardous communication program and recordkeeping.	●	●	●	●	●	●	●

● required practice

IV. Criteria 4

Protect people and animals from coming in direct contact with Highly Hazardous Pesticides through engineering controls for handling, loading and application.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Use enclosed cabs on all ground boom application equipment for restricted use pesticides.	●	●	●	●	●	●	●
Use charcoal air filters or any comparable system in enclosed cabs of all ground boom application equipment.	●	●	●	●	●	●	●
Based on storage volume, maintain written emergency hazardous spill plan (Spill Prevention Control and Countermeasures plan requirements or other regulatory requirements).	●	●	●	●	●	●	●

● recommended practice, ● required practice

V. Criteria 5

Ensure persons who prepare and apply pesticides are healthy, skilled, and trained in pesticide application safety, 18 years or older and not pregnant or nursing.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Maintain required training and certification of pesticide applicators consistent with current requirements.	●	●	●	●	●	●	●
Communicate information to employees on hazardous chemicals through labels, safety data sheets (SDS), and training programs as well as a written hazardous communication program and recordkeeping.	●	●	●	●	●	●	●

● required practice

VI. Criteria 6

Ensure persons who prepare and apply pesticides employ appropriate PPE as specified on the EPA approved label.

VII. Criteria 7

Apply pesticides in accordance with all label requirements, including rate restriction (both per application and seasonal), application weather restrictions, water body buffer restrictions, and sensitive area restrictions as published on labels for each individual chemical.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Follow label and use directions of crop protection products, and only on the crops specified.	●	●	●	●	●	●	●
Consider environmentally sensitive sites such as homes, desirable vegetation, streams, rivers lakes and public areas.	●	●	●	●	●	●	●
Consider climatic and environmental factors such as temperature inversions, wind speed and wind direction.	●	●	●	●	●	●	●
Comply with Worker Protection Standard regarding protective clothing, posting, restricted re-entry intervals, and training.	●	●	●	●	●	●	●
Report pesticide use consistent with state laws and regulations.	●	●	●	●	●	●	●
Maintain required training and certification of pesticide applicators consistent with current requirements.	●	●	●	●	●	●	●
For restricted use pesticides, maintain records of plant protection chemical applications according to product label, such as product name, rates, field locations, etc.	●	●	●	●	●	●	●
When required for a specific restricted use pesticide, including highly hazardous pesticides, employ closed application and delivery systems and product-specific mitigation as mandated on label, to prevent exposure of workers and operators, spills and environmental exposure.	●	●	●	●	●	●	●
Make records available for audits by state enforcement officials consistent with current regulations.	●	●	●	●	●	●	●
Communicate information to employees on hazardous chemicals through labels, safety data sheets (SDS), and training programs as well as a written hazardous communication program and recordkeeping.	●	●	●	●	●	●	●

● required practice

VIII. Criteria 8

Store pesticides and other agrochemicals in a secure and approved location.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Maintain pesticide storage in separate free-standing building or cabinet used only for pesticides. Post signs and keep building locked. Provide roof and maintain impermeable floor or install curbs in storage and handling areas to contain leaks and spills of pesticides and fuels. No drain or provide floor drain to acceptable holding tank.	●	●	●	●	●	●	●

● recommended practice

IX. Criteria 9

Appropriate use and disposal of containers.

X. Criteria 10

Use appropriate disposal methods of unused products/mixes and rinsate.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Read label and follow any local ordinances on disposal of pesticide containers.	●	●	●	●	●	●	●
Dispose of sprayer rinse water by spraying on crops listed on label in accordance with label directions.	●	●	●	●	●	●	●
Triple rinse all jug, bottle or bucket pesticide containers and encourage supplier of totes to rinse totes or take other measures to minimize exposure to workers or the environment.	●	●	●	●	●	●	●
Recycle farm chemical containers where recycle centers are available or dispose of rinsed containers and empty bags in municipal landfill. Check local ordinances on disposal of pesticide containers.	●	●	●	●	●	●	●
For mixing liquid fertilizers, provide for impermeable surface, sloped to keep spills contained where applicable. Locate farm chemical storage and handling facilities as far from water sources as possible—at least 500 feet from surface water sources and 300 feet from water well.	●	●	●	●	●	●	●

● recommended practice, ● required practice

GUIDANCE FOR CROP PROTECTION IMPLEMENTATION

● **Recommended practice**

Integrated pest management (IPM) is a science-based approach that strategizes tools and techniques to identify and manage pests. Cotton acts as a host to a broad range of pests and IPM can be implemented at all stages of crop production.

The five steps of IPM include identifying pests, monitoring pests' numbers and activity, determining action thresholds, exploring treatment options (chemical, biological, mechanical, cultural/sanitation, prevention), and evaluating results. Through IPM, pesticide need reduction decreases, also eliminating pest re-entry intervals. IPM is not a one-size-fits-all practice and is not a single pest control method but rather a series of pest management evaluations, decisions, and controls. It varies from region to region and is based on an individual basis.

IPM helps ensure that pesticides are used only as necessary, based on historical and current pest monitoring and biological knowledge. IPM practices are based on the latest scientific and technological information available. Therefore, the practices continually improve with science. Multiple pest management techniques are integrated to manipulate pest populations, minimize losses, and minimize costly pesticide inputs in a manner that has the most benign potential risk to the environment. It is an ecosystem-based approach that focuses on the longer term and combines pesticide use with biological control, habitat preservation, and use of resistant varieties. The components of Trust Protocol grower members' IPM are:

- **Monitoring** - Over time, many pesticides have gradually lost their effectiveness due to pests developing resistance. Constant monitoring using bucket traps, sticky traps, or digital monitoring tools helps in the early detection of the pests and thereby helping to prevent or minimize an outbreak[3].
- **Containment** – Invasive species are often introduced to new environments and are often likely to cause economic or environmental harm. The invasive boll weevil altered the course of history in the American South by devastating the region's premier crop in the early 1900s. It remains a major nemesis of the cotton industry today. Participating in community-wide and area-wide containment and eradication involving resistant invasive or non-native pests is a crucial component of IPM.
- **Crop consultants** - Certified crop consultants, are qualified and keep up with the changing times. They follow a holistic approach to IPM. First, they set action thresholds, a point at which pest populations indicate that pest control action must be taken, followed by monitoring and identifying the pests. Once identified they manage the crop to prevent the pests from being a threat and then propose control approaches.
- **Action thresholds** - In the simplest form, action thresholds are rules that help the pest control technician know when a particular problem is severe enough to warrant control. To guide future pest control decisions and initiate insecticide treatments, the level at which pests will become an economic threat is set by science-based action thresholds.
- **Inspection** - Inspecting and documenting annual records of fields, weed, insect, and disease pressure helps establish action thresholds and treatment options under the IPM approach. Weeds are the major breeding hub for pests, so constant inspection is required in both fall and spring for the cotton fields. Monitoring weeds in the fall will identify any summer species and perennial weeds that escaped in the previous year's weed monitoring program. Also, it will help identify any winter species that are emerging. Spring monitoring helps identify any species that escaped earlier management and perennial regrowth. Keeping records of the monitoring process will assist better in determining the most effective control strategy.

[3] United States Environmental Protection Agency, EPA Guidance on Managing Pesticide Resistance

- **Management** - The weed seed bank should always be as low as possible to remain profitable. Reserve weed seeds develop from unmanaged infestations, and once deposited into the ground, seeds can grow and mature into more weeds, creating a cycle hard to stop resulting in a higher risk for resistance development. So, managing weed seed bank by spot- applying post-emergence and layby herbicides or hand-rogue sporadic infestations to prevent seed build-up is essential.
- **Economic thresholds** - The conventional economic injury level is the lowest insect population density that will cause economic damage, while the economic threshold is the population level where insect control should be initiated to avoid exceeding the economic injury level. Cotton production faces multiple insect pests, stresses, and new developments make an economic injury level based on insect populations less practical. Using plant-based economic injury level measurements helps determine economic thresholds. By comparing the observed square shed percentage with the shed limit derived from the break-even shed rate (the plant-based economic injury level), one can assess the effectiveness of a previous economic threshold. To effectively utilize the plant-based economic injury level, it is necessary to collect timely field monitoring data during the squaring period and to be able to use that data to calculate the economic injury level quickly.
- **Production practices** – Cultural/sanitation practices such as using appropriate planting date, optimum soil temperatures, applicable seeding rate, seed vitality, and seedbed preparation promote healthy stands. Some pests/insects do not overwinter in winter and migrate from different states each year, so timing the planting and sowing appropriate seedling rate to avoid the peak of infestation is important for managing the insects and pests.

Highly Hazardous Pesticides are acknowledged to present particularly high levels of acute or chronic hazards to health or the environment according to internationally accepted classification systems such as the World Health Organization or Global Harmonized System or their listing in relevant binding international agreements or conventions. In addition, pesticides that appear to cause severe or irreversible harm to health or the environment under conditions of use in a country may be treated as highly hazardous[4]. In the U.S., pesticide regulations are primarily controlled by the EPA, and it mandates to protect people and animals coming in direct contact with highly hazardous pesticides. The Trust Protocol ensures grower members follow the EPA regulations on protecting people by recommending growers to use charcoal air filters in enclosed cabs for all ground boom applications mainly used to remove gases. Charcoal air filters help combat volatile compounds released during pesticide spray by filtering the gases through a bed of activated carbon. Activated charcoal acts as a magnet to adsorb many chemicals.

The Trust Protocol recommends grower members to maintain pesticide storage in a separate free-standing building or cabinet used only for pesticides, post signs and keep building locked, provide roof and maintain impermeable floor or install curbs in storage and handling areas to contain leaks and spills. This type of containment protects the environment from accidental leaks of large storage tanks, thereby preventing spills from entering the soil and ground or surface water.

Most herbicide labels contain information on sprayer clean-out following application, and this information may range from very specific to quite general. Disposal of sprayer rinse water is recommended by the Trust Protocol. For mixing liquid formulations, providing impermeable surfaces help to contain any spills and with handling chemical storage far from water sources it ensures accidental leaks from storage tanks to surface or ground water. Recycling farm chemical containers where recycle centers are available or disposing rinsed containers and empty bags

[4] United Nations Environment Programme, Highly Hazardous Pesticides

in a municipal landfill is recommended by the Trust Protocol. Organizations like the Pesticide Stewardship Alliance and Ag Container Recycling Council help in the recycling of farm containers by assigning contractors to each local region that collect containers at no fee for growers and commercial applicators.

Required practice

The Trust Protocol requires grower members to **destroy stalks** to eliminate, reduce or prevent overwintering insects and diseases in keeping with local or regional conditions and regulations for implementing the IPM plan. Cotton is a perennial shrub that may survive for many years, and the perennial habit allows it to regrow following harvest providing favorable habitable conditions for pests and diseases. In order to prevent the overwintering of insects and diseases, stalks should be shredded and disked to destroy the entire plant. Good sanitation in the field will reduce pathogen inoculum in cotton plants.

The Trust Protocol mandates grower members only to use crop protection materials registered and approved by the EPA and state regulators. U.S. cotton growers follow the United States' stringent legal requirements for pesticide use. Under this highly regulated and scrutinized process, products are registered with the EPA, which conducts an in-depth risk analysis considering interactions with humans, plants, pollinators, water, animals, and protected species. The EPA analyzes the risk factor under worst-case scenarios, adding additional safety factors for children and infants, and if research finds there are any potential causes for concern, the EPA evaluates protective options that would eliminate the concern.

The EPA may also categorize the product as a restricted-use product which limits purchase and use to trained licensed professionals. The results are then provided for public review and feedback, which the EPA considers for its final decision. Once approved and labeled with clearly identified uses and safeguards, authorizations are reviewed every 15 years—effectiveness and environmental safety are paramount when pesticides undergo the approval process. Different types of pesticides carry various risks that need to be taken into account for humans, animals, and the health and safety of humans, animals, and the environment. Therefore, it is critical to understand the specific risks associated with each pesticide to take appropriate precautions.

The labels provided on the pesticides must be legally registered under the EPA. They should provide detailed information about the product type and directions of use with precautions and measures. Trust Protocol also obligates grower members to comply with regulations applicable to agricultural operations under the Occupational Safety and Health Act (OSHA) and EPA worker protection standards and other appropriate regulations. OSHA is a regulatory agency of the United States Department of Labor. OSHA's mission is to ensure that employees work in a safe and healthful environment by setting and enforcing standards and providing training, outreach, education, and assistance. To be a part of the Trust Protocol program, grower members must comply with all applicable OSHA standards.

Trust Protocol mandates employing closed applications and following strict instructions of the labels while using highly hazardous pesticides. The EPA classifies a pesticide as restricted/highly hazardous if the use of the pesticide might result in an unreasonable adverse effect on human health and/or the environment; however, application by trained persons according to label directions would protect against such an effect. This restricted-use classification must be stated on the label.

For highly hazardous pesticides, employing closed mixing and loading systems prevents pesticides from coming in contact with handlers or other persons during mixing and loading. Closed application and delivery systems include mixing and loading systems (mechanical systems and water-soluble packaging), enclosed cabs, and pesticide containment systems (containment pads) to prevent exposure of workers and operators, spills, and environmental exposure. An enclosed cab—such as a tractor cab, cockpit, or truck/vehicle cab—surrounds the occupant and may prevent exposure to the pesticides being applied as long as any doors, hatches, or windows

are kept closed at all times during the pesticide application. Retaining records of plant protection chemical applications to product labels such as product name, rates, field location, method of application is mandated by Trust Protocol.

Keeping application records satisfies regulatory requirements, and it is also wise to practice. Documents can prove invaluable in the event of a complaint or lawsuit. Suppose there is ever a legal claim against an applicator about the suspected use of a pesticide; in that case, the pesticide application records provide all information about the pesticides that have been applied and thus protect the applicator by providing documentation. They can also help to determine which pesticide treatments work, which treatments do not work, and why. They can help applicators plan future purchases of pesticides so that they buy only the actual amount needed. Record keeping also helps avoid costly pesticide product and container disposal problems, help increase profits, and helps decide on integrated pest management. In a medical emergency, pesticide records can provide the information necessary to the medical staff. The records also document the steps taken to protect farmworkers and the environment.

Complying with the U.S. EPA's Worker Protection Standard (WPS) is essential for Trust Protocol grower members. WPS is a regulation to reduce the risk of pesticide poisonings, injuries, and exposure to agricultural workers and pesticide handlers. The WPS includes requirements for the protection of agricultural workers on farms and in forests, nurseries, greenhouses, and handlers of agricultural pesticides. This section also contains requirements for training, decontamination, notification, emergency assistance, personal protective equipment (PPE), and restricted-entry intervals (REI). The REI specifies how much time must pass between applying a pesticide and the reentry of unprotected workers into a treated area. The EPA sets REIs. In addition to WPS regulations, the Trust Protocol requires grower members to communicate information to employees on hazardous chemicals through labels, safety data sheets (SDS), and training programs. SDS provides detailed information about the product's composition, physical and chemical properties and hazards, toxicological and ecological information, and first-aid procedures. Ideally, the MSDS is used in combination with the pesticide label, but it should never be used in place of the actual product label.

The Trust Protocol requires grower members to provide regular employee educational programs dealing with farm safety, pesticide handling, and on-farm environmental concerns with maintaining the required training and certification of pesticide applicators consistent with current requirements. Pesticide Certification and training are about allowing access to pesticides only by competent persons. The certification process by all the states, tribes, and territories must be accomplished through EPA-approved programs. Each state is responsible for implementing the certification program.

In addition, keeping records available for audits by state enforcement officials is essential. The state agencies conduct routine inspections of licensed pesticide businesses, public agencies, and restricted use pesticide dealers. Inspections include reviewing pesticide application records, restricted pesticide sales records, safety equipment, storage areas, application equipment, vehicles, anti-siphon devices, and employee training records. Use observations are also conducted to observe actual pesticide applications to ensure compliance with label directions and state and federal regulations. The state enforcement agencies also investigate pesticide misuse, incidents, and consumer complaints.

To prevent adverse environmental effects, pesticide users must be aware of sensitive areas, non-target plants and animals (especially endangered species), and harmful impact on habitat. In addition to water sources, sensitive areas include sites where a pesticide could easily injure living things. Leaving an untreated buffer zone around a sensitive area is a practical way to avoid contaminating it. Applicators must assess the vulnerability of neighboring properties and those areas downwind of the application site. Evaluating weather conditions for temperature inversions, wind direction, and wind speed before

deciding whether to spray is essential. The applicator may have to adjust the application equipment to reduce spray drift.

Maintaining a written emergency hazardous spill plan is required for the grower members. A spill is any accidental release of a pesticide. The spill may be a minor one involving only a few leaking containers, or it may be a major accident in which a piece of equipment malfunctions and releases its contents, or a tank truck or rail car overturns and spills its cargo. All users of pesticides must be thoroughly familiar with the laws and guidelines governing chemical spills. To prepare for a pesticide emergency or incident, having a well-thought-out emergency response plan is a must. Making sure the program includes designating an emergency response coordinator, maintaining a list of emergency response agencies, preparing a map of the facility, keeping a product inventory of the types and quantities of stored chemicals, and knowing what emergency equipment and supplies are available.

Trust Protocol mandates reading labels and following local ordinances on the disposal of pesticide containers. All pesticide labels contain general instructions for the appropriate storage and removal of the pesticide and its container. State and local laws may vary considerably, so specific instructions usually are not included. The label provides a wealth of information. Failure to follow the instructions on a pesticide label can result in a serious pesticide accident and constitutes a legal violation that may make the user subject to civil or criminal prosecution. The label is a legal document. The user is liable for personal injury, crop or site damage, or pollution through misuse of a pesticide. For pesticide containers, triple-rinsing, or equivalent, disposal in an approved landfill is mandatory for all grower members. The triple rinse procedure includes emptying the pesticide container into a spray tank and allowing the container to drain for 30 seconds, then adding rinse water to the container, so it's 1/4th full, then pouring rinsate into the spray tank and draining for 30 seconds three times.

PRINCIPLE 5: HARVEST PREPARATION

The harvest preparation principle is based on managing harvesting and preserving the fiber quality of the bales. Most of cotton growers in the U.S. use defoliants to terminate cotton growth, open bolls, and desiccate the cotton plant to prepare for harvest. The Trust Protocol ensures quality preservation through the following criteria:

I. Criteria 1

Use only EPA approved harvest aid chemicals (defoliants and desiccants) to prepare the crop for machine harvesting.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Choose application method (e.g., ground or aerial) according to local conditions and proximity to sensitive areas i.e., buildings, streams, etc.	●	●	●	●	●	●	●

● recommended practice

II. Criteria 2

Ensure compliance with product specific labels and pre-harvest intervals (days required between application and harvest).

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Follow precautions listed on harvest aid chemical labels.	●	●	●	●	●	●	●
Choose application method (e.g., ground or aerial) according to local conditions and proximity to sensitive areas i.e., buildings, streams, etc.	●	●	●	●	●	●	●

● recommended practice, ● required practice

III. Criteria 3

Manage harvest and store seed cotton to preserve fiber quality.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Base selection and rates of harvest aid materials on crop status using techniques such as percent open boll, nodes above cracked boll, environmental conditions and harvest schedule.	●	●	●	●	●	●	●
Use application technology such as adjuvants and proper nozzle size to ensure good coverage while maintaining drift control.	●	●	●	●	●	●	●
Locate modules to appropriate site as soon as possible to provide greatest protection from water damage.	●	●	●	●	●	●	●
Urge ginner to follow practices to completely remove module cover materials, and provide 100% inspection of module before entering the seed cotton feeders.	●	●	●	●	●	●	●

● recommended practice, ● not applicable

IV. Criteria 4

Monitor fields and equipment to minimize lint contamination from plastic and other non-cotton fiber contaminants.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Inspect fields and remove any plastic mulch, shopping bags, plastic hay twine or other potential lint contaminants.	●	●	●	●	●	●	●
Inspect module covers and wraps for damage and repair as needed to prevent plastic contamination.	●	●	●	●	●	●	●

● recommended practice

V. Criteria 5

Maintain buffer zones from other crops, buildings, water bodies and non-cotton areas.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Be aware of school and residential areas and maintain buffer zones for harvest aid applications.	●	●	●	●	●	●	●
Choose application method (e.g., ground or aerial) according to local conditions and proximity to sensitive areas i.e., buildings, streams, etc.	●	●	●	●	●	●	●

● recommended practice, ● required practice

GUIDANCE FOR HARVEST PREPARATION IMPLEMENTATION

● Recommended practice

Before mechanical harvest, **harvest aids** help with leaf removal and boll opening. Harvest-aid chemicals speed up the harvest of a mature crop and lessen the risk of yield or fiber quality loss before harvest. Plants adequately defoliated have a lower trash content and require less lint cleaning at the gin, resulting in less fiber damage and better quality. An incorrect selection of harvest-aid items can lead to poor harvest preparation and production, and quality decreases. Ideally, the harvest aid material chosen should defoliate the entire plant and open all mature bolls with minimal drying or desiccation. The Trust Protocol recommends using techniques such as percent open boll, nodes above cracked boll, environmental conditions, and harvest schedule to select the harvest aid materials and application rate.

Harvest aid materials help prepare the crop for mechanical harvest to attain high-quality lint and fiber. These materials also stimulate the opening of the bolls. Reduction in boll maturity time to be harvested is vital for minimizing crop yields and quality losses due to weathering and other environmental conditions. Locating modules to the appropriate site as soon as possible to provide the greatest protection from water damage is crucial to maintaining the fiber quality. By forming modules, seed cotton can be stored in the field, and harvest can continue depending on weather conditions[5]. Rain damage is a significant threat to cotton quality that increases moisture content, reduces color grade, causes rot and heating in the module, degrading the fiber quality and increasing the energy required to dry the seed cotton.

Urging ginners to follow practices to completely remove module cover materials and provide 100% inspection of module before entering the seed

[5] Texas A&M University, Seed Cotton Handling & Storage

cotton feeders is another step for preserving fiber quality. Module covers are reusable unless they have large rips and tears on the surface. However, the breakdown of the water-resistant coating can seriously degrade seed cotton protection. Ginning high-moisture content reduces gin productivity so urging the ginner to inspect the module before it goes to the |feeder prevents contamination issues. Trust Protocol also recommends using application technology such as adjuvants and proper nozzle size to ensure good coverage while maintaining drift control. Adjuvants and proper nozzle size help the defoliant break up into droplets, providing uniform spray and good coverage.

The Trust Protocol recommends that grower members minimize lint contamination from plastics or other contaminants to preserve the fiber quality by using practices such as inspecting fields and removing any plastic mulch, shopping bags, plastic hay twine, or other potential lint contaminants. Plastic contamination unintentionally occurs on the farm, mainly during the harvesting stage, generating fiber contamination. Module covers are mostly made of plastic, and over time, module covers may deteriorate and tear, leaving pieces of plastic on seed cotton as contamination. More often, using plastic twine to tie down module covers leads to contamination problems. Even a short piece of plastic twine or rope can contaminate several bales of cotton if the material enters the gin. The foreign material will be shredded and dispersed into the lint.

Plastic irrigation ditch liners left in the field can also be picked up by harvesting equipment and mixed with the seed cotton. If not removed, this plastic will travel through the gin with the seed cotton, become shredded, and remain with the ginned lint. These small pieces of plastic or micro-plastics cause significant problems at textile mills by increasing spinning costs and their very presence in fabric. As a result, large quantities of fabric must be sold as defective materials. Trash that may have blown into a field from the roadside is also a contaminant. Debris such as small plastic bags can be picked up by harvesters and ginned with seed cotton. Inspecting module covers and wraps for damage and repair as needed to prevent plastic contamination helps retain fiber quality and decreases lint contamination[6]. Most module covers are coated with plastic materials to ensure lighter weight and lower cost. More than 88% of contamination in cotton is due to plastic module wraps. So, inspecting beforehand ensures reduced plastic contamination.

● Required practice

The Trust Protocol mandates grower members **follow precautions listed on harvest aid chemical labels.** Chemical labels contain detailed information on how to use the product correctly and legally. Labels also include information on potential hazards associated with the product and instructions to follow in the event of a poisoning or spill. Following label instructions will allow to minimize the risks and maximize the benefits. The Trust Protocol also obligates growers to be aware of sensitive areas such as school and residential areas and maintain buffer zones for harvest aid applications.

[6] National Cotton Council, **Plastic Contamination**, 2017

PRINCIPLE 6: BIODIVERSITY

Biodiversity is the variety of life forms found in the environment. Through this principle the Trust Protocol promotes plants, animals and microorganism biodiversity and efficient use of the land. Biodiversity provides a functioning ecosystem that supplies oxygen, clean air and water, pest control and many ecosystems' services.

I. Criteria 1

Employ practices that maximize agricultural ecosystem services through enhancing natural habitats and increasing biodiversity in and around agricultural landscapes.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Enhance pollinator habitat by allowing native vegetation (e.g., wildflowers or native grasses) to become established in appropriate areas.	●	●	●	●	●	●	●
Engage a private land wildlife biologist for a farm visit to evaluate short term and long-term future possibilities.	●	●	●	●	●	●	●
Conduct your own wildlife population trends assessment and whether you view the population each common species such as bobwhite quail, turkey, and deer as declining, stable or increasing.	●	●	●	●	●	●	●
Enrolled or have participated in an existing program such as Conservation Reserve, EQIP, or other federal or state conservation programs.	●	●	●	●	●	●	●
Implement stream habitat improvement for native species.	●	●	●	●	●	●	●

● recommended practice, ● not applicable

II. Criteria 2

Use tools for assessing habitat potential to guide ecosystem enhancement of cotton fields and surrounding areas.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Quantify the Habitat Potential Index for the 10% or more of the cultivated cotton land's immediate surroundings using Field to Market tools or complete the U.S. Cotton Trust Protocol Fieldprint Analysis (this is provided when you complete step 6 of enrollment).	●	●	●	●	●	●	●
Conduct whole farm habitat potential evaluation using tools by NRCS or Field to Market.	●	●	●	●	●	●	●
Be able to access maps, images, or sketches of the whole farm that can be used for identifying cover types such as forest, cultivated land, field borders, water features, wetlands, riparian areas, buffer zones, grassed areas, and non-profitable degraded areas for consideration for conversion to wildlife usage.	●	●	●	●	●	●	●

● regional required practice, ● required practice

III. Criteria 3

Promote agronomic and cultural practices that enhance soil health and biodiversity.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Be able to access maps, images, or sketches of the whole farm that can be used for identifying cover types such as forest, cultivated land, field borders, water features, wetlands, riparian areas, buffer zones, grassed areas, and non-profitable degraded areas for consideration for conversion to wildlife usage.	●	●	●	●	●	●	●
Enhance pollinator habitat by allowing native vegetation (e.g., wildflowers or native grasses) to become established in appropriate areas.	●	●	●	●	●	●	●

● recommended practice, ● required practice

IV. Criteria 4

Retire unproductive land and convert to a use suitable for promoting biodiversity.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Use return on investment analysis to evaluate each acre or zone of a field for profitability and consider converting non profitable land to conservation areas or enrolling in programs such as the USDA's Conservation Reserve Program (CRP).	●	●	●	●	●	●	●
Consider converting highly erodible non-productive land to conservation reserve, permanent pasture, or wildlife habitat areas.	●	●	●	●	●	●	●

● recommended practice

GUIDANCE FOR BIODIVERSITY IMPLEMENTATION

● Recommended practice

The Trust Protocol recommends conducting a **wildlife population trends assessment** and keeping an accounting on declining, stable or increasing population. Mapping the biodiversity trends helps growers to better understand which animal species are present around their farm. It also helps to understand the interconnected links between these resources, the environment and management systems and farming practices. Through the assessment the growers can also gain an insight into level of biodiversity degradation or increase in their farms. Engaging a private land wildlife biologist for a farm visit to evaluate short term and long-term future possibilities also helps in mapping the biodiversity footprint on the farm. Private lands biologists (also called Farm Bill biologists and technical assistance providers) play a critical role in habitat conservation by matching landowners with suitable conservation programs that best fit the landowners' personal habitat and land-use goals.

The Trust Protocol advises grower members to enhance pollinator habitat by allowing native vegetation (e.g., wildflowers or native grasses) to become established in appropriate areas. Conservation of pollinator habitat can enhance overall biodiversity and the ecosystem services it provides including pest population reduction, protect soil and water quality by mitigating runoff, and protecting against soil erosion. The Trust Protocol also encourages grower members to enroll or participate in an existing program such as the Conservation Reserve Program (CRP), Environmental Quality Incentives Program (EQIP), or other federal or state conservation programs. EQIP provides financial and technical assistance to agricultural producers to address natural resource concerns and deliver environmental benefits[7]. Other conservation programs also give the growers similar aid. However, conservation programs come with some limitations such as traditional farming practices cannot be used. Also, these programs are hugely impacted by grain commodity prices.

[7] USDA National Resources Conservation Science, Conservation Compliance for Highly Erodible Lands

Converting highly erodible non-productive land to conservation reserve, permanent pasture, or wildlife areas is highly recommended by the Trust Protocol to grower members. Highly erodible land is any land that can erode at excessive rates because of its soil properties and/or is designated by field and based on the proportion of the total field acreage that contains highly erodible soils[8]. These lands are non-productive and converting to lands that can be used as forage or wildlife areas not only controls erosion but also promotes the ecosystem's health. In addition, using return on investment (ROI) analysis to evaluate each acre or zone of a field for profitability and consider converting non profitable land to conservation areas or enrolling in programs such as CRP also helps growers to get both financial and agronomic view for the entire farm.

● Required practice

The Trust Protocol mandates grower members provide the Habitat Potential Index for the 10% or more of the cultivated cotton land's immediate surroundings using Field to Market tools or complete the Fieldprint Analysis. One of the requirements for growers to become members is providing **FTM data for a minimum of 10% of the fields.** Trust Protocol also directs growers to access maps, images, or sketches of the whole farm that can be used for identifying cover types such as forest, cultivated land, field borders, water features, wetlands, riparian areas, buffer zones, grassed areas, and non-profitable degraded areas for consideration for conversion to wildlife usage.

PRINCIPLE 7: FIBER QUALITY, DATA MANAGEMENT, AND TRACEABILITY

Fiber quality plays a vital role in the creation and end of the product. Fiber quality is influenced by genetic and environmental factors throughout the growing season. The Trust Protocol recommends grower members incorporate practices that can preserve the fiber quality and identity of the bales through the following criteria:

I. Criteria 1

Use locally adapted varieties to match productivity and market needs.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Consider data from replicated trials or other reliable sources when selecting varieties.	●	●	●	●	●	●	●
Select varieties with fiber quality profile and yield potential consistent with market needs and profitability.	●	●	●	●	●	●	●

● recommended practice

[8] United States Department of Agriculture, Conservation Compliance – Highly Erodible Land and Wetlands, August 2015

II. Criteria 2

Maintain identity preservation of bales through the national Permanent Bale Identification System.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Keep records of fields, bales and fiber quality.	●	●	●	●	●	●	●

● recommended practice

III. Criteria 3

Provide transparency of quality measurements for supply chain participants.

IV. Criteria 4

Ensure data integrity in capturing, aggregating, and reporting against environmental goals and metrics through robust system design and independent verification.

V. Criteria 5

Quantify field environmental impacts annually using the Field to Market Field Print Platform to monitor and quantify the following:

a. **Land use**
b. **Soil loss**
c. **Energy**
d. **Water use efficiency**
e. **Greenhouse gas**
f. **Biodiversity (habitat potential index)**
g. **Water quality index**
h. **Soil carbon index**

VI. Criteria 6

Aggregate Field to Market metric data values for land use, energy, soil loss, water use, greenhouse gas, and carbon and report the information on the Protocol Platform.

VII. Criteria 7

Ensure security and data integrity of environmental metrics to meet Science Based Target Initiatives and Sustainable Development Goals of global textile partners.

GUIDANCE FOR FIBER QUALITY, DATA MANAGEMENT, AND TRACEABILITY IMPLEMENTATION

● **Recommended practice**

Considering data from replicated trials or other reliable sources when selecting varieties helps improve field productivity and ensure better quality. Fiber quality is heavily dependent on heritability and the selection accuracy is based on a variety of trials which only improves with the number of replicates. Replicated multi-location trials are the best sources when selecting varieties.

Cotton production is determined by at least three main factors and their interactions, including genotype, environment, and production practices. These three factors and their interactions influence both yield and fiber quality potential and ultimately determine the grower's and processors' profitability. Selecting the desired cotton cultivars would provide high fiber yield, good fiber quality, and efficient processing at the ginning site and textile mill.

More details on data management and traceability can be found on the U.S. Cotton Trust Protocol website.

PRINCIPLE 8: FARM MANAGEMENT

Farms are becoming more advanced each day because they are quickly adopting new technologies, machinery, and equipment in order to increase their production capabilities. The U.S. Cotton Trust Protocol requires the farm infrastructure to be kept safe for workers, farm animals and the environment.

I. Criteria 1

Assure an effective farm management system

II. Criteria 2

Keep farm infrastructure safe for workers, farm animals, and the environment

III. Criteria 3

Provide training to promote safe working habits and practices

IV. Criteria 4

Develop continuous improvement plans using insights from Fieldprint metrics

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Secure all pesticides during transportation and ensure they do not come in contact with human or animal food, clothing, bedding, toiletries or similar items.	●	●	●	●	●	●	●
Locate above-ground petroleum storage tanks at a minimum of 25 feet from any source of ignition or propane source.	●	●	●	●	●	●	●
If applicable based on storage volume, provide dikes for petroleum tanks to hold 110% of tank volume.	●	●	●	●	●	●	●
Work to assure on-farm disposal sites are in compliance with state and local regulations. Properly dispose of used motor oils, adhesives, paints, cleaners or lubricants.	●	●	●	●	●	●	●
Read label and follow any local ordinances on disposal of pesticide containers.	●	●	●	●	●	●	●
Based on storage volume, maintain written emergency hazardous spill plan (Spill Prevention Control and Countermeasures plan requirements or other regulatory requirements).	●	●	●	●	●	●	●
Provide regular employee educational programs dealing with farm safety, pesticide handling and on-farm environmental concerns.	●	●	●	●	●	●	●
Enrolled or have participated in an existing program such as Conservation Reserve, EQIP, or other federal or state conservation programs.	●	●	●	●	●	●	●

● recommended practice, ● required practice

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Maintain well casing height in compliance with local regulations.	●	●	●	●	●	●	●
Follow local regulations for unused and/or abandoned water wells.	●	●	●	●	●	●	●
Test drinking water used by family and farm workers periodically to assure bacteria, nitrate and other pollutants do not exceed safe levels.	●	●	●	●	●	●	●
Use anti-backflow devices or maintain air-gap of at least 6 inches between tap or hose and liquid in spray tank. Do not make cross-connections between water supplies.	●	●	●	●	●	●	●
Dispose of sprayer rinse water by spraying on crops listed on label in accordance with label directions.	●	●	●	●	●	●	●
Triple rinse all jug, bottle or bucket pesticide containers and encourage supplier of totes to rinse totes or take other measures to minimize exposure to workers or the environment.	●	●	●	●	●	●	●
Recycle farm chemical containers where recycle centers are available or dispose of rinsed containers and empty bags in municipal landfill. Check local ordinances on disposal of pesticide containers.	●	●	●	●	●	●	●
Locate wastewater disposal systems more than 500 feet from potential surface water sources.	●	●	●	●	●	●	●
Post slow-moving vehicle emblem for any machine that travels 25 mph or less on public roads.	●	●	●	●	●	●	●
Provide a roll-over protective structure (ROPS) on all tractors operated by employees.	●	●	●	●	●	●	●
Maintain safety guards and/or shields on farm equipment.	●	●	●	●	●	●	●
Employees have access to sanitation that consists of drinking water, toilet and handwashing facilities.	●	●	●	●	●	●	●
Provide personal protective equipment for eyes, ears, face, head, feet, and hands where necessary.	●	●	●	●	●	●	●
Identify confined spaces and provide guidance on proper procedures to follow when entering these spaces.	●	●	●	●	●	●	●

● recommended practice, ● required practice, ● not applicable

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Lockout electrical power before performing maintenance or service. Tag out with detailed instructions on tag to help prevent accidental injury to personnel.	●	●	●	●	●	●	●
Review and update the health and safety program periodically; conduct periodic meetings and training sessions.	●	●	●	●	●	●	●
Ensure that accident and emergency procedures, including first aid kits and access to appropriate transportation to medical facilities, are in place.	●	●	●	●	●	●	●
Participate in producer, professional, or civic organizations actively promoting community well-being.	●	●	●	●	●	●	●

● regional required practice, ● required practice

GUIDANCE FOR FARM MANAGEMENT IMPLEMENTATION

● Recommended practice

While spraying, maintaining a gap of at least 6 inches between tap or hose and liquid in the spray tank is recommended or using an anti-backflow device. Anti-backflow/anti-back siphoning devices help prevent water from being contaminated by allowing it to flow in one direction. Back-siphoning is the reverse flow of liquids into a fill hose, and it sucks tank contents back into the water supply. Back-siphoning starts with reducing water pressure and can draw enormous quantities of pesticide directly into the water source. This happens when the end of the water hose is allowed to extend below the surface of the spray mixture while filling a spray tank. The simplest method of preventing backflow is to maintain an air gap between the discharge end of the water supply line and the pesticide solution in the spray tank.

The Trust Protocol also recommends locating a wastewater disposal systems more than 500 feet from potential surface water sources. A properly installed and maintained system for treating and disposing of farm wastewater will minimize the impact on groundwater and surface water

● Required practice

Trust Protocol requires growers to secure all pesticides during transportation and ensure they do not encounter human or animal food, clothing, bedding, toiletries or similar items. Every pesticide user must understand possible hazards and the procedures for minimizing the risks of transporting pesticides. Careless handling of containers incorrectly maintained equipment, and unforeseen accidents can all lead to pesticide leaks and spills during transport. Some pesticides are highly flammable and that increases the danger (fire and toxic fumes) while they are in transit. Another concern is that other vehicles could scatter pesticide products spilled on public roads, and such events can potentially injure bystanders and animals. In addition, transportation-related pesticide spills and leaks can contaminate the environment, endanger residential areas, and lead to financial losses and legal actions.

The use of aboveground fuel storage tanks has increased over the past two decades on the farms. This is primarily due to the expenditure by property owners and insurance companies

on cleanup associated with leakage from buried tanks. When private wells and community water supplies are contaminated, cleanup efforts are extensive and costly. The Trust Protocol requires grower members to locate above-ground petroleum storage tanks at a minimum of 25 feet from any source of ignition or propane source. Few risks of above-ground storage tanks are vehicles can back into them, vandals can deface or damage them, and trespassers can steal their contents. The tanks are also vulnerable to high winds, flooding, and lightning. Trust Protocol also requires grower members to build dikes around petroleum storage to hold 110% of tank volume based on the storage volume. Dikes are structures constructed around an oil tank to contain the oil in case the tank collapses. Tank dikes are also called fire walls. The volume or space inside the tank dike should be greater than the volume of the tank.

The Trust protocol also requires grower members to comply with local and state regulations on the on-farm disposal of used motor oils, adhesives, paints, cleaners, or lubricants. Small quantities of motor oil can do quite a bit of damage to the environment. According to the EPA, the used oil from one oil change can contaminate one million gallons of water. The EPA also notes that used oil can contain toxic chemicals and heavy metals that may affect the health of people and wildlife. Grower members are also required to ensure that accident and emergency procedures, including first aid kits and access to appropriate transportation to medical facilities, are in place. Also, maintaining safety guards and/or shields on farm equipment.

The Trust Protocol obligates grower members to keep the farm safe by reviewing and updating the health and safety of the program periodically and conducting periodic meetings and training sessions for the workers. Working on a farm is inherently risky, whether you are a family member on a small operation operating equipment or caring for animals or a hired employee performing a more specialized job on a more significant operation. Farmers and workers, whether family employees or those employed from off the farm also experience an unusual array of workplace health-related hazards. The hazards include respiratory (dust, gases, oxygen-deficient workspaces, and organic vapors); chemicals (pesticides, cleaners, fertilizers); noise; ultraviolet radiation through sunlight; and bacterial/viral pathogens. By conducting periodic health and safety meetings, workers will be aware of the problem and learn to participate actively by sharing best practices.

For safety, the Trust Protocol mandates grower members to provide Personal Protective Equipment (PPE) for eyes, ears, face, head, feet, and hands where necessary. PPE is worn to minimize exposure to hazards that cause serious workplace injury and illness. PPE includes such items as coveralls or protective suits, footwear, gloves, aprons, respirators, eyewear, and headgear and offers various levels of protection, depending on the type of resistant material used. Some items of PPE simply act as filters by keeping dry or spray material off the skin. Others offer better protection against water-based products. Some offer protection from chemicals (solvent and/or active ingredient) that make up a concentrated pesticide product. PPE must be comfortable to ensure that people wear it and wear it properly.

Trust Protocol requires growers to provide a roll-overprotective structure (ROPS) on all tractors operated by employees. ROPS are metal bars, frames, or crush-proof cabs that are designed to provide a protective zone around the tractor operator in the event of a rollover or overturn. Also called anti-roll bars or ROPS cabs, all are designed to prevent death and minimize injury. The ROPS frame must pass a series of static or dynamic crush tests. These tests examine the ability of the ROPS to withstand various loads to see if the protective zone around the operator station remains intact in an overturn. The tests are extensive and destroy the rollover protective structure. A homemade bar attached to the tractor axle, or simple sunshades, cannot protect the operator if the tractor overturns. Farm Use tractors with ROPS to save lives operators should not add their own rollover protection devices to tractors manufactured without ROPS.

Posting a slow-moving vehicle emblem for any machine that travels 25 mph or less on public roads is highly recommended. Traffic studies show that two out of three highway accidents involving slow-moving vehicles (SMV) rear-end collisions and that ninety percent of these accidents happen during daylight hours. The use of the SMV sign reduces accidents and saves lives. Signs in poor condition provide little or no protection in traffic. Keeping the sign clean for maximum visibility and replacing damaged or faded signs immediately are also recommended. A faded sign will not be visible for the required 500 feet. When this occurs, the tractor or farm machinery and the operator's life are in danger and the law is violated. For extending the life of the SMV, covering, or keeping the sign out of the sun when not using the piece of machinery is ideal.

Participating in producer, professional, or civic organizations actively promoting community wellbeing and ensuring employees have access to sanitation consisting of drinking water, toilet, and handwashing facilities is required by the Trust Protocol. Producers should ensure that there is water for drinking and sanitation purposes. The water provided must be safe (suitable for both drinking and washing purposes and the water must be filtered either naturally or artificially for drinking purposes), accessible (source of water should be close to work proximity), and sufficient (should be always available for everyone at all times). In the U.S., rural drinking water comes from artesian sources naturally filtered by sand and gravel deep underneath the earth's surface and is recognized as safe. However, as a precautionary measure against inadvertent contamination, Trust Protocol grower members are recommended to test the drinking water used by family and farm workers periodically to assure bacteria, nitrate, and other pollutants do not exceed safe levels.

The Trust Protocol requires identifying confined spaces and providing guidance with following proper procedures while entering these spaces. As per, the Department of Labor - OSHA, many workplaces contain areas that are considered "confined spaces" because, while they are not necessarily designed for people, they are large enough for workers to enter and perform specific jobs. A confined space also has limited or restricted means for entry or exit and is not designed for continuous occupancy. Confined spaces include, but are not limited to, tanks, vessels, silos, storage bins, hoppers, vaults, pits, manholes, tunnels, equipment housings, ductwork, pipelines, etc. The Trust Protocol requires grower members to lock out electrical power before performing maintenance or service. Without the use of proper Lockout/Tagout safety procedures, the equipment being worked on can unexpectedly start up or release these forms of energy. This can lead to injuries and even death of the person working on the equipment or near it. Tagging out with detailed instructions helps prevent accidental injury to personnel.

PRINCIPLE 9: WORKER WELL-BEING

I. Criteria 1

Workers are treated fairly.

II. Criteria 2

Wages are equal to or higher than required by law are provided.

III. Criteria 3

Working hours comply with national and state law.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Be knowledgeable of rules in accordance with U.S. labor laws for hiring migrant workers, including their children, housing, working conditions and compensation.	●	●	●	●	●	●	●
Housing for temporary labor that consists of shelter, water supply, toilet facilities, bathing facilities, sewage disposal facilities, lighting, refuse disposal, first aid, pest control, and reporting of communicable disease.	●	●	●	●	●	●	●
The wage rate paid to workers is equal to or higher than the federal minimum wage and wage records show that workers are paid regularly and on time through an appropriate method of payment.	●	●	●	●	●	●	●

● required practice

V. Criteria 5

There is no forced, compulsory, bonded or trafficked labor

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Be knowledgeable of rules in accordance with U.S. labor laws for hiring migrant workers, including their children, housing, working conditions and compensation.	●	●	●	●	●	●	●
There are no forms of forced labor or forced prison labor on the farm.	●	●	●	●	●	●	●

● required practice

V.I Criteria 6

Workplace is kept safe by minimizing hazards.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Comply with regulations applicable to agricultural operations under the Occupational Safety and Health Act as well as EPA worker protection standards and other appropriate regulations.	●	●	●	●	●	●	●
Post, record and report occupational illness and injuries in a timely manner.	●	●	●	●	●	●	●
Post slow-moving vehicle emblem for any machine that travels 25 mph or less on public roads.	●	●	●	●	●	●	●
Provide a roll-over protective structure (ROPS) on all tractors operated by employees.	●	●	●	●	●	●	●
Maintain safety guards and/or shields on farm equipment.	●	●	●	●	●	●	●
Provide personal protective equipment for eyes, ears, face, head, feet, and hands where necessary.	●	●	●	●	●	●	●
Identify confined spaces and provide guidance on proper procedures to follow when entering these spaces.	●	●	●	●	●	●	●
Lock out electrical power before performing maintenance or service. Tag out with detailed instructions on tag to help prevent accidental injury to personnel.	●	●	●	●	●	●	●
Review and update the health and safety program periodically; conduct periodic meetings and training sessions.	●	●	●	●	●	●	●
Ensure that accident and emergency procedures, including first aid kits and access to appropriate transportation to medical facilities, are in place.	●	●	●	●	●	●	●
Participate in producer, professional, or civic organizations actively promoting community well-being.	●	●	●	●	●	●	●

● regional required practice, ● required practice

VII. Criteria 7

Discrimination of all forms is forbidden.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Taking measures such as posting Equal Employment Opportunity Commission (EEOC) placards and posters in common areas in order to advise of the policy to prevent all forms of discrimination in the workplace and also advise of grievance procedures.	●	●	●	●	●	●	●

● required practice

VIII. Criteria 8

Equal wages are paid to workers who perform the same job, regardless of gender, race, or ethnicity.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Equal wages are paid to workers who perform the same job, irrespective of gender.	●	●	●	●	●	●	●

● required practice

IX. Criteria 9

Safe and hygienic sanitation is accessible.

X. Criteria 10

Potable drinking water and wash-water are provided.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Test drinking water used by family and farm workers periodically to assure bacteria, nitrate and other pollutants do not exceed safe levels.	●	●	●	●	●	●	●
Housing for temporary labor that consists of shelter, water supply, toilet facilities, bathing facilities, sewage disposal facilities, lighting, refuse disposal, first aid, pest control, and reporting of communicable disease.	●	●	●	●	●	●	●
Employees have access to sanitation that consists of drinking water, toilet and handwashing facilities.	●	●	●	●	●	●	●

● recommended practice, ● required practice

XI. Criteria 11

Workers have freedom of associations.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Workers have the right to establish or join organizations of their own choosing and there is no management interference with the right of workers to bargain collectively.	●	●	●	●	●	●	●

● required practice

XII. Criteria 12

Abuse or harassment of any kind is not tolerated.

Questions	FWI	SWI	SWNI	MSI	MSNI	SEI	SENI
Use of corporal punishment, mental or physical coercion, sexual harassment or physical or verbal abuse or harassment of any kind is prohibited.	●	●	●	●	●	●	●

● required practice

GUIDANCE FOR WORKER WELL-BEING IMPLEMENTATION

● Required practice

The Trust Protocol mandates grower members to **follow all the federal, local, and state laws.**

In the United States, the Fair Labor Standards Act (FLSA) mandates a minimum wage, breaks for meals and rest, and forbids child labor and involuntary servitude. In addition, most U.S. states have enacted legislation requiring minimum wage to be equal to the federal minimum wage level. The act applies to both full-time and part-time workers. All employees of certain enterprises having workers engaged in interstate commerce, producing goods for interstate commerce, or handling, selling, or otherwise working on goods or materials that have been moved in or produced for such commerce by any person, are covered by the FLSA. The Trust Protocol is aligned with all required practices by law.

Under the U.S. Department of Labor, The Migrant and Seasonal Agricultural worker protection act (MSPA) provide protection of seasonal or temporary agricultural workers by mandating the employer for disclosing in writing or orally mentioning the wage rates, housing, transportation, and working conditions. The MSPA requires farm labor contractors, agricultural employers, and agricultural associations, who recruit, solicit, hire, employ, furnish, transport, or house agricultural workers, as well as providers of migrant housing, to meet specific minimum requirements in their dealings with migrant and seasonal agricultural workers[9]. The Trust Protocol mandates grower members follow the MSPA law. However, the 2012 Consensus of Agriculture reported 89% of the cotton farms owned by family and partnerships within the family so there are not many growers who employ migrant and seasonal workers in cotton production in USA.

[9] Department of U.S. Labor, Employment Law Guide

Trust Protocol grower members abide by the laws enforced by the EEOC to prohibit employers from paying employees differently based on race, color, gender, and national origin. The Equal Pay Act (EPA) by USEEOC (U.S. Equal Employment Opportunity compensation) requires that men and women in the same workplace be given equal pay for equal work. The jobs need not be identical, but they must be substantially similar. Job content (not job titles) determines whether jobs are substantially equal. All forms of pay are covered by this law, including salary, overtime pay, bonuses, stock options, profit sharing and bonus plans, life insurance, vacation and holiday pay, cleaning or gasoline allowances, hotel accommodations, reimbursement for travel expenses, and benefits. If there is an inequality in wages between men and women, employers may not reduce the wages of either sex to equalize their pay. An individual alleging a violation of the EPA may go directly to court and is not required to file an EEOC charge beforehand. The time limit for filing an EPA charge with the EEOC and the time limit for going to court are the same: within two years of the alleged unlawful compensation practice or, in the case of a willful violation, within three years. The filing of an EEOC charge under the EPA does not extend the time frame for going to court[10].

(OSHA rules require that hazardous activities be prohibited for minors, and the farm must follow state laws governing night-time labor. The Trust Protocol is in alignment with the International Labor Organization on child labor and forbids all forms of exploitation. There must be no workers employed below the minimum age for employment defined by law. The U.S. Department of Labor enforces the Fair Labor Standards Act (FLSA) which restricts the employment and abuse of child workers. Provisions under the act are designed to protect children's access to education and prohibit them from jobs that are detrimental to their health and safety.

In terms of farm work, minors need to be a minimum age of 16 to be employed by their parents in any capacity on a farm owned by their family. All employees using pesticides must be at least 18 years old. The Fair Labor Standards Act (FLSA) prohibits minors under age 18 years old to work in any occupation that it deems to be hazardous. Among these occupations are excavation, manufacturing explosives, mining, and operating many types of power-driven equipment. Certain industries allow minors under age 18 to perform certain tasks at worksites whose primary work activity is dangerous, but these tasks are very specific and the state and federal government closely monitor compliance. Child labor laws vary from state to state. Regulations provide very specific information on these occupations and other safety standards for minor employees. Consulting with state department helps to understand the local and state laws. Federal law states that 14–15-year-olds cannot work over 8 hours a day, with no more than 3 hours on a school day, and over 40 hours a week, with no more than 18 hours per week while in school. Minors are also not allowed to work before 7:00 am or after 7:00 pm respectively (dol.gov/child labor).

Penal labor in the United States is explicitly allowed by the 13th Amendment of the U.S. Constitution: "Neither slavery nor involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction". The Trust Protocol abides by the U.S. laws and mandates grower members ensure there are no forms of forced labor or forced prison labor on the farm in order to be a part of the program.

The U.S. Equal Employment Opportunity Commission (EEOC) enforces federal laws prohibiting discrimination against an employee during various work situations, including hiring, firing, promotions, training, wages, and benefits. Trust Protocol grower members must take measures such as posting EEOC placards and posters in common areas to advise of the policy to prevent all forms of discrimination in the workplace and advise of grievance procedures. The U.S labor organization) the government regularly reports to the regular government reporting under the ILO (International 1998 Declaration on Fundamental Principles and Rights at Work, on the extent to which the

[10] U.S. Equal Employment Opportunity Commission, **Laws & Guidance**

U.S government gives effect to the principles of non-discrimination reflected in ILO Conventions 100 (Equal Remuneration) and 111 (Discrimination in Employment and Occupation). The labor department also contributes to regular reporting on compliance with the UN Convention on the Elimination of All Forms of Racial Discrimination.

The Trust Protocol grower members guarantee that workers/employees have the freedom to create or join organizations of their own choosing, and that there is no management interference with the ability of workers to bargain collectively. US law protects worker rights in accordance with ILO convention 87, thus applying nationally to all workers (dol.gov). Freedom of association is the right of workers and employers to organize to defend their interests, including for the purpose of negotiating salaries, benefits, and other conditions of work. It is a fundamental right that underpins democratic representation and governance. Collective bargaining is an essential element of freedom of association. It helps to ensure that workers and employers have an equal voice in negotiations and provides workers the opportunity to seek to improve their living and working conditions. Effective recognition of the right to collective bargaining can contribute to economic development and growth by increasing certainty and stability in the workplace and improving labor-management relations. The ILO's fundamental convention on freedom of association (No. 87, adopted in 1948) says that workers and employers alike have the right to establish and join organizations of their own choosing without previous authorization; and that these organizations have the right to draw up their own rules, elect their own representatives, and organize their programs and activities freely.

Harassment is a type of workplace discrimination, according to the EEOC. Harassment is a form of employment discrimination that violates Title VII of the Civil Rights Act of 1964, the Age Discrimination in Employment Act of 1967, (ADEA), and the Americans with Disabilities Act of 1990, (ADA). It is forbidden to employ corporal punishment, sexual harassment, or verbal/physical abuse. Harassment is unwelcome conduct that is based on race, color, religion, sex (including sexual orientation, gender identity, or pregnancy), national origin, older age (beginning at age 40), disability, or genetic information (including family medical history). Harassment becomes unlawful where 1) enduring the offensive conduct becomes a condition of continued employment, or 2) the conduct is severe or pervasive enough to create a work environment that a reasonable person would consider intimidating, hostile, or abusive. The Trust Protocol mandates grower members forbid any kind of harassment especially on the grounds of corporal punishment, sexual harassment, or verbal/physical abuse.

03: REVISION OF GROWER ENROLLMENT QUESTIONNAIRE

The U.S. Cotton Trust Protocol is committed to following best practices in developing and revising the questionnaire and principles & criteria by adopting the following steps:

1) Defining the objectives of the questionnaire/ P&C and justifying the need for its development or revision.

2) Providing the directly and indirectly affected stakeholders with information about the revision process and ensuring their participation through meetings, and teleconferences.

3) Supporting decision-making by considering of variety of opinions from diverse stakeholders.

4) Making the questionnaire/P&C and supporting documents available to Trust Protocol members.

5) Reviewing the revised questionnaire/ P&C on a three-year cycle

Detailed outline for standards reviews

1) **Initiating review** - the Trust Protocol will internally initiate the review or development of questionnaire/P&C every three years, or it may be requested any time by any member or stakeholder by writing to info@trustprotocol.org. The leadership team will decide if the proposal requires the development of new questionnaire/P&C or a major/minor revision to existing questionnaire/P&C is needed.

2) **Plan of Action** - Depending on the leadership team's decision, the Trust Protocol will develop a plan of action to document the process, including the rationale for the need for a new/revision questionnaire/P&C, timeline of the process, decision-making procedures, and point of contact for the development and revision process.

3) **Advisory Committee** - the Trust Protocol may create an advisory committee in relevance topic of interest for the new development or revision process. Advisory committee will consist of stakeholders who will assist in drafting process, analyze opinions of both internal and external stakeholders and provide datapoints from testing phases.

4) **Revision Types** - Three types of revisions is practiced at the Trust Protocol- minor, major and new standard development. Minor revisions like correcting grammatical errors, updating references, language correction is done internally with the leadership team approval without any stakeholder consultation. Major revisions like change in the intent require advisory committee stakeholder consultation and content approval. All new development will require both internal and external stakeholder consultation for approval.

5) **Decision-making process** - The highest governing body for the Trust Protocol is the Board of Directors. For the final content of all new and all major revisions, the leadership team of the Trust Protocol presents to the Board of Directors for content approval through appropriate rationale, stakeholder opinions, reference terms and datapoints on field testing.

04: REFERENCE

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