2020 CAIP Investmet Area Guidelines:
INNOVATIVE AGRICULTURAL SYSTEMS

*These guidelines represent one of 11 investment areas within the **County Agricultural Investment Program (CAIP)** to provide Kentucky agricultural producers cost-share assistance on practices that increase net farm income and opportunities to try new/innovative technologies or systems that improve farm efficiency and productivity.*

Funded participants shall adhere to all local, state, and federal rules and regulations.

Investment Area Prerequisites:

- Recipients of Kentucky Agricultural Development Funds are required to retain ownership of facilities and equipment for at least five years.
- Producers shall retain adequate insurance coverage to replace any and all capital improvement/equipment projects funded with Kentucky Agricultural Development Funds.
- Producers participating in this Investment Area must complete at least one full system (selected from A-E) to receive cost-share funds.

Investment Area Limitations:

- Eligible equipment does not include purchase of construction or drilling equipment.

A. Fenceline Feeders

Definition: The practice of installing livestock feeding structures into strategically selected fencelines in close proximity to feedstuff storage facilities. This practice is supported by NRCS practice standard codes 382: Fence and 561: Heavy Use Area Protection.

Purpose: The purpose of fenceline feeders is to reduce the impact of winter-feeding on pastures and improve the operational efficiency of a winter-feeding area. These structures are designed so that the tractor never has to enter the field to load hay bales into the structure.

The major advantage of this practice is the savings in time, but it also prevents compaction of soils and having to interact with cattle/calves while trying to feed. These structures are also designed to reduce runoff and erosion associated with traditional heavily compacted, muddy winter-feeding areas by incorporating heavy traffic pads around the structure.

Locating the feeders in close proximity to the hay storage barns improves the functionality and the overall efficiency of the winter-feeding process as well. Fenceline feeder systems are also excellent options for mobility limited or disabled producers.

Conditions Where Practice Applies: Fenceline feeder systems may be utilized on livestock operations where winter feeding occurs. Fenceline feeding systems offer an alternative to traditional in-field bale feeding during the wet winter conditions that Kentucky often experiences. This practice is applicable where a producer desires to reduce the impact of winter-feeding on pastures and improve the operational efficiency of a winter-feeding area.

See "Appendix A: Fenceline Feeders" for criteria, planning considerations, operations & maintenance and references related to this investment category.

Eligible Cost-Share Items:

1. Fencing materials
2. Feeding equipment systems
3. Troughs
4. Building materials for structure
5. Geotextile fabric
6. Fabric pins
7. Gravel
8. Concrete
9. Feeder panels
10. Gates
11. Mounting hardware
12. Gravel paver grid
13. Documented, hired labor
14. Contracted site preparation and equipment rental

B. Gravel Paver Grid

Definition: Gravel paver grid is a reinforcing plastic grid that can be incorporated in to a heavy traffic pad to facilitate manure collection and improve the durability of the gravel pad. This practice is supported by NRCS practice standard code 561: Heavy Use Area Protection.

Purpose: The purpose of gravel paver grid is to increase the durability of heavy traffic pads, facilitate manure collection, and improve livestock surfaces.

Conditions Where Practice Applies: A gravel paver grid may be used in heavy use areas of livestock operations to reinforce new or existing heavy traffic pads.

See "Appendix B: Gravel Paver Grid" for criteria, planning considerations, operations & maintenance and references related to this investment category.

Eligible Cost-Share Items:

1. Geotextile fabric
2. Fabric pins
3. Gravel
4. Gravel paver grid
5. Documented, hired labor
6. Contracted site preparation and equipment rental
7. Documented, hired labor
8. Contracted site preparation and equipment rental

C. Solar Powered Watering System

Definition: The practice of using a solar panel and pump to distribute water within a water harvesting system. This practice includes the infrastructure necessary to direct, store, and distribute water. This practice is supported by NRCS practice standard codes 570: Stormwater Runoff Control , 614: Watering Facility, and 636: Water Harvesting Catchment.

Purpose: The purpose of solar powered pumping systems is to utilize solar energy in conjunction with a solar panel and pump to deliver water to remote locations of agricultural operations.

Conditions Where Practice Applies: Solar powered pumping systems can be utilized to aid in delivery of water within water harvesting systems.

See "Appendix C: Solar Powered Watering System" for criteria, planning considerations, operations & maintenance and references related to this investment category.

Eligible Cost-Share Items:

1. Solar panel
2. Solar powered pump
3. Pump controller
4. Water pipe, water pipe connections and materials
5. Wire
6. Mounting pole
7. Pole mount adapter for solar panel
8. Water storage tank/cistern
9. Fencing
10. Grid tie
11. Documented, hired labor
12. Contracted site preparation and equipment rental

D. Tire Waterers

Definition: A livestock watering tank constructed from a repurposed heavy equipment tire. This practice is supported by NRCS practice standard codes 382: Fence, 561: Heavy Use Area Protection, and 614: Watering Facility.

Purpose: A tire tank waterer uses a loader, grader, dump truck, or similar OTR (off the road) tire as the reservoir. Because these tires have a large circumference, livestock have more access for drinking as compared to traditional automatic fountains. A heavy equipment tire tank should remain operational for over 10 years, and in many cases, will cost less than other types of permanent water sources. The savings on the fixture can be spent on additional concrete or geotextile fabric and gravel to improve the surfaces surrounding the waterer.

Conditions Where Practice Applies: Tire waterers are useful on livestock operations where production could benefit from increased access to water. Sharing these structures between multiple pastures aids in providing water in rotational grazing systems.

See "Appendix D: Tire Waterers" for criteria, planning considerations, operations & maintenance and references related to this investment category.

Eligible Cost-Share Items:

1. Water pipe, pipe connections and associated materials
2. Fencing materials
3. Float valve
4. Concrete
5. Geotextile fabric
6. Fabric pins
7. Gravel
8. Fencing
9. Heavy equipment tire
10. Documented, hired labor
11. Contracted site preparation and equipment rental

E. Water Harvesting

Definition: The practice of collecting runoff from precipitation events for beneficial reuse on the farm. This practice includes the infrastructure necessary to direct, store, and distribute water. This practice is supported by NRCS practice standard codes 614: Watering Facility and 636: Water Harvesting Catchment.

Purpose: The purpose of water harvesting is to capture and store runoff water that would normally be a detriment to production and distribute it to provide water for livestock, crops, or other beneficial uses. Reducing runoff volumes can reduce the potential for erosion and the transport of contaminants to nearby water resources.

Conditions Where Practice Applies: Water harvesting can be conducted by collecting precipitation from the landscape or from impervious surfaces such as roofs. The beneficial reuse of effluent from tile

drainage or cooling systems may also serve as a source of water. Water harvesting from the landscape can involve the installation of ponds to detain water that can be distributed to points of need.

See "Appendix E: Water Harvesting" for criteria, planning considerations, operations & maintenance and references related to this investment category.

Eligible Cost-Share Items:

1. Gutter
2. Downspout
3. Water pipe
4. Miscellaneous plumbing parts
5. Above ground storage tank
6. Cistern
7. Materials for surfaces
8. Waterers
9. Pumps
10. Documented, hired labor
11. Contracted site preparation and equipment rental

Appendix A: Fenceline Feeders

Fenceline Feeding System demonstration site at Eden Shale Farm

Definition: The practice of installing livestock feeding structures into strategically selected fencelines in close proximity to feedstuff storage facilities. This practice is supported by NRCS practice standard codes 382: Fence and 561: Heavy Use Area Protection. This practice is soon to be eligible for cost share through CAIP and EQIP in Kentucky.

Purpose: The purpose of fenceline feeders is to reduce the impact of winter-feeding on pastures and improve the operational efficiency of a winter-feeding area. These structures are designed so that the tractor never has to enter the field to load hay bales into the structure. The major advantage of this practice is the savings in time, but it also prevents compaction of soils and having to interact with cattle/calves while trying to feed. These structures are also designed to reduce runoff and erosion associated with traditional heavily compacted, muddy winter-feeding areas by incorporating heavy traffic pads around the structure. Locating the feeders in close proximity to the hay storage barns improves the functionality and the overall efficiency of the winter-feeding process as well. Fenceline feeder systems are also excellent options for mobility limited or disabled producers.

Conditions Where Practice Applies: Fenceline feeder systems can be utilized on livestock operations where winter feeding occurs. Fenceline feeding systems offer an alternative to traditional in-field bale feeding during the wet winter conditions that Kentucky often experiences. This practice is applicable where a producer desires to reduce the impact of winter-feeding on pastures and improve the operational efficiency of a winter-feeding area.

Criteria: This system is typically suitable for any producer that routinely feeds hay during the winter months. Incorporation of supplemental feed troughs into the system design can aid in meeting livestock dietary needs. Specific siting criteria are discussed in the Planning Considerations section.

Planning Considerations: Site selection for winter-feeding is one of the most critical steps of the planning process. In order to create a functional design, the location must save the producer time and create a better environment for cattle. Evaluation of the soils based on hydrologic and engineering properties can aid in determining the best location. Soils should be well drained and capable of supporting shallow excavations with light structural improvements. Sites should always be located away from water bodies, steep slopes, or other sensitive features

on the farm. Avoiding these areas can prevent excess creation of mud, erosion, and runoff. Sites on ridges or flat ground, away from sensitive features are favored. Choosing an area with a natural or man-made windbreak can also be beneficial to animal welfare and overall productivity. When siting a fenceline feeding system, it is also important to consider the location of hay storage. To maximize efficiency, feeding structures should be located near hay storage, while still following the previously presented guidelines. Savings in time, fuel, and wear on equipment can offset part of the expense of infrastructure upgrades.

Gates located at the entrances of the feeding structure are needed to keep calves contained. If calves are not present, the entrances can be left open further increasing the efficiency of the design. Omitting the entrance gates all together, because they are not needed, also reduces cost. Grind all bolts flush to wood to prevent injury to livestock. The number and size of nails in various parts of the structure should comply with the recommendations provided in the Uniform Building Code and applicable state building codes.

Operation and Maintenance: Feeders should be loaded with roll bale hay as necessary to accommodate the dietary needs of the winter feeding herd. Hay wastage should be minimized by structure design. Hay that is out of reach can be pushed up and moved to the back of the feeding structure, by subsequent bales, to provide access and reduce waste. At the end of the season, the interior of the structure should be cleaned.

The manure pack that is generated surrounding the structure should be scraped, stored, and applied to pastures or crop fields to take advantage of the organic matter and nutrients in the manure. This step in the cycle is critical to the overall functional design. It supports the efficiency goals of this design, which reduce waste (time, hay, cattle effort, etc.). It utilizes waste that's normally overlooked (manure) and create a benefit from it (higher yields, better soil health, etc.). The physical integrity of the structure should be checked on a routine basis to ensure fasteners and fixtures remain functional and safe for livestock use.

References:

Fenceline Feeder Systems for Beef Cattle Production and Environmental Protection (In Process)
Midwest Plan Service. 1987. Beef Housing and Equipment Handbook. MWPS-6. 1995 4th edition. [Ames, Iowa]: Midwest Plan Service.
Uniform Building Code. Whitter, Calif. (5360 South Workman Mill Rd., Whitter 90601): International Conference of Building Officials, 1988. Print.

Appendix B: Gravel Paver Grid

Gravel paver grid can be used to reinforce heavy use areas. It allows a producer to scrape manure from an area without completely removing gravel.

Definition: Gravel paver grid is a reinforcing plastic grid that can be incorporated in to a heavy traffic pad to facilitate manure collection and improve the durability of the gravel pad. This practice is supported by NRCS practice standard code 561: Heavy Use Area Protection. This practice is soon to be eligible for cost share through CAIP and EQIP in Kentucky.

Purpose: The purpose of gravel paver grid is to increase the durability of heavy traffic pads, facilitate manure collection, and improve livestock surfaces.

Conditions Where Practice Applies: gravel paver grid can be used in heavy use areas of livestock operations to reinforce new or existing heavy traffic pads.

Criteria: gravel paver grid should be installed around feeders, waterers, and in livestock housing areas. This material is ideal for areas where manure collection for beneficial reuse occurs.

Planning Considerations: Where gravel paver grid is to be used, a base of geotextile fabric and 6 inches of rock is required before placing the concrete or grid. Detailed instructions on installing a heavy traffic pad for livestock can be obtained from All Weather Surfaces for Livestock (AEN-115).

Operation and Maintenance: Gravel paver grid should be installed as a component of a heavy traffic pad. Follow Planning Consideration guidelines and installation procedures detailed within AEN 115. Periodic maintenance in the form of top dressing the grid with gravel and compacting may be necessary. Periodic removal of manure buildup will be an integral part of the maintenance of this structure.

References:

All Weather Surfaces for Livestock (AEN 115).
http://www2.ca.uky.edu/agcomm/pubs/aen/aen115/aen115.pdf

Appendix C: Solar Powered Watering Systems

A solar powered pump installed in a water harvesting system.

Definition: The practice of using a solar panel and pump to distribute water within a water harvesting system. This practice includes the infrastructure necessary to direct, store, and distribute water. This practice is supported by NRCS practice standard codes 570: Stormwater Runoff Control , 614: Watering Facility, and 636: Water Harvesting Catchment. This practice is eligible for cost share through CAIP and EQIP in Kentucky.

Purpose: The purpose of solar powered pumping systems is to utilize solar energy in conjunction with a solar panel and pump to deliver water to remote locations of agricultural operations.

Conditions Where Practice Applies: Solar powered pumping systems can be utilized to aid in delivery of water within water harvesting systems.

Criteria: Solar powered pumping systems should be prioritized for use in remote locations of agricultural operations where city water or electricity may be unavailable. These systems are especially useful within a rotational grazing scheme.

Planning Considerations: Calculate the total vertical distance that water will be pumped and estimate friction loss of flow due to the horizontal length of pipe. Combining this with the estimated power provided by the solar panel you can estimate the flow rate that the system will be expected to provide. The manual for a potential pump should have a rating chart to relate power provided by panel to flow rates from pump.

Cattle drink at a rate of 2-6 gallons per minute and need upwards of 30 gallons per day in the hottest days of the year. It would be wise to size your system and tank large enough to accommodate your herd to use the waterer with a sufficient recharge rate so that it does not go dry if the herd comes to drink as a group. Additional storage in a closed tank can be used to gravity feed the water and supplement the water supply in case of a day with low light that would limit solar power capacity. A battery may also be included for low light days when solar power capacity may be sub-optimal. Oversized panels can help to offset the loss of potential power on low-light days. A benefit of the pump controller is that it also serves

as a linear current booster, which allows for the pump to operate at lower light levels and can boost the power supplied to the pump by up to 30%.

Operation and Maintenance: Check for proper function of the system on a routine basis while in use by livestock. Check at an interval equal to or less than the expected consumption time for the portion of stored water available to livestock if the pump stops working (the water available for gravity flow or in the tank). Ensure all drains/outlets from the system are protected in a manner that reduces the potential for erosion. Exclude livestock and vehicle traffic from accessing and damaging components of the system.

References:

USDA-ARS, Agriculture Handbook No. 600, Handbook of Water Harvesting.
https://naldc.nal.usda.gov/naldc/download.xhtml?id=CAT87208954&content=PDF

USDA NRCS, Technical Note No. 28. Design of Small Photovoltaic (PV) Solar-Powered Water Pump Systems.
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_046471.pdf
Solar Powered Watering Systems for Agricultural Use (In Process)

Appendix D: Tire Waterer

A tire tank waterer installed at Eden Shale Farm in northern Kentucky. The tire tank waterer is used to supply drinking water to cattle in two separate areas.

Definition: A livestock watering tank constructed from a repurposed heavy equipment tire. This practice is supported by NRCS practice standard codes 382: Fence, 561: Heavy Use Area Protection, and 614: Watering Facility. This practice is soon to be eligible for cost share through CAIP and EQIP in Kentucky.

Purpose: A tire tank waterer uses a loader, grader, dump truck, or similar OTR (off the road) tire as the reservoir. Because these tires have a large circumference, livestock have more access for drinking as compared to traditional automatic fountains. A heavy equipment tire tank should remain operational for over 10 years, and in many cases, will cost less than other types of permanent water sources. The savings on the fixture can be spent on additional concrete or geotextile fabric and gravel to improve the surfaces surrounding the waterer.

Conditions Where Practice Applies: Tire waterers are useful on livestock operations where production could benefit from increased access to water. Sharing these structures between multiple pastures aids in providing water in rotational grazing systems.

Criteria: Tire waterers require a source of water to operate. Water can be supplied from city water or harvested rainwater.

Planning Considerations: Choosing the location of the tire tank waterer is an important first step. Careful placement of the tire tank waterer will allow for better pasture management, will facilitate rotational grazing, and will help protect soil and water quality. Consider the maximum distance cattle must travel to reach the tire tank waterer. Travel distances greater than 800 feet often lead to non-uniform pasture grazing, as cattle will tend to overgraze near the water source and underutilize portions of the pasture located further away. Consider locations that will allow a single tire tank to serve multiple pastures or will allow for intense grazing schemes.

To protect soil and water quality, exclude cattle from waterbodies and locate the tire tank waterer as far away from streams and riparian areas as possible. If excluding ponds, locate the tire tank waterer down-

gradient so runoff from the watering area does not flow into the pond. Locate the tire tank waterer on solid, well-drained soils. To prevent the development of mud, a heavy use pad should be constructed around the tire tank waterer. Ensure the site is accessible by tractor. Because of the large size and weight of the tire, a tractor, preferably with a front-end loader, is required for installation.

Operation and Maintenance: Once the tire tank is operational, monitor it to make sure the needs of animals are being met. If animals are observed climbing into the tank, exclude them with a cross member attached to the top of the tire tank or a fence across the structure. Periodic cleaning may be necessary to remove nutrients that can promote algal growth. Avoid using copper sulfate to control algae to prevent toxicity and metal corrosion.

References:

All-weather surfaces for livestock (AEN-115).
http://www2.ca.uky.edu/agcomm/pubs/AEN/AEN115/AEN115.pdf

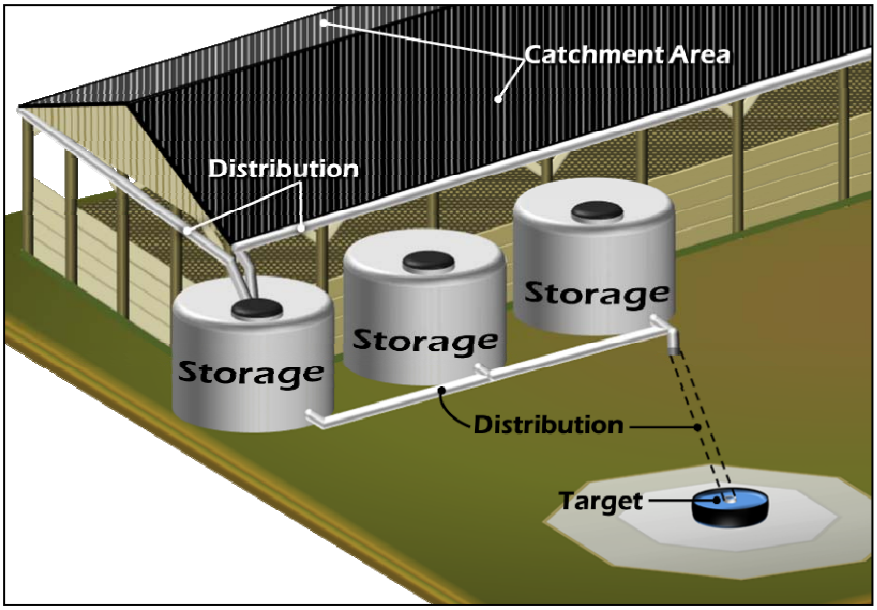
All-weather surfaces for cattle watering facilities (ID-229).
http://www2.ca.uky.edu/agcomm/pubs/ID/ID229/ID229.pdf

Pasture feeding, streamside grazing, and the Kentucky Agriculture Water Quality Plan (AEN-105).
http://www2.ca.uky.edu/agcomm/pubs/aen/aen105/aen105.pdf

Providing water for beef cattle in rotational grazing systems (ID-236).
http://www2.ca.uky.edu/agcomm/pubs/ID/ID236/ID236.pdf

Tire Tanks for Watering Livestock
http://www.2.ca.uky.edu/agcomm/pubs/AEN/AEN133/AEN133.pdf

Appendix E: Water Harvesting



A basic design consists of a catchment area, distribution, storage, and a target.

Definition: The practice of collecting runoff from precipitation events for beneficial reuse on the farm. This practice includes the infrastructure necessary to direct, store, and distribute water. This practice is supported by NRCS practice standard codes 614: Watering Facility and 636: Water Harvesting Catchment. This practice is eligible for cost share through CAIP and EQIP in Kentucky.

Purpose: The purpose of water harvesting is to capture and store runoff water that would normally be a detriment to production and distribute it to provide water for livestock, crops, or other beneficial uses. Reducing runoff volumes can reduce the potential for erosion and the transport of contaminants to nearby water resources.

Conditions Where Practice Applies: Water harvesting can be conducted by collecting precipitation from the landscape or from impervious surfaces such as roofs. The beneficial reuse of effluent from tile drainage or cooling systems may also serve as a source of water. Water harvesting from the landscape can involve the installation of ponds to detain water that can be distributed to points of need.

Criteria: It is important that water quality meet the standards set forth in Drinking Water Quality Guidelines for Cattle (ID 170) prior to use for livestock. Analysis of water to be used as a nutrient solution for plants should also be conducted prior to use for irrigation. Guidelines for irrigation water quality can be obtained from the Kentucky Irrigation and Drought Resources website. Laboratory services can be contracted through local water quality laboratories or arranged with the help of experts from the Cooperative Extension Service.

Planning Considerations: Water quality can be impacted by contaminants on catchment surfaces or from activities within the watershed where water is harvested. It is important to make efforts to reduce the potential for contamination through implementing best management practices that reduce the risk of nutrient, pathogen, or chemical entry into water harvesting systems. Livestock and pesticide/fertilizer related activities should always be kept at least 100 feet away from areas that serve as landscape water harvesting sources. Filter strips and exclusion fencing can aid in the protection of water quality. Impervious surfaces that are used to collect precipitation should be inspected regularly to ensure no

visible signs of corrosion or potential contamination are present. Incorporating a first flush diverter into rooftop catchments can aid in reducing the potential for contamination from pollutant deposition on catchment surfaces.

Harvesting from impervious surfaces such as roofs requires the installation of gutters and downspouts, contamination reduction devices, storage vessels, and a distribution system. In many cases, gravity flow can be utilized to distribute water. The use of pumps may be necessary depending on the elevation change from source to the desired location of water delivery. This practice may be especially useful in remote locations where access to city water may be limited or cost prohibitive.

The system should be designed and sized based on projected water needs. The volume of storage within the system should be equal to the total expected demand for one month at the location where water will be utilized. Refer to water harvesting systems for livestock and the associated system sizing calculator to calculate system demand and the necessary size for components.

Freeze protection and winterizing are important considerations when planning a water harvesting system. If your system will be exposed to freezing conditions then it is critical that it can be drained during those periods.

All applicable federal, state, and local building and plumbing codes must be followed when installing and operating a water harvesting and distribution system. Plans and designs for water harvesting systems can be developed through your local conservation district or cooperative extension service.

Operation and Maintenance: It is important that an operational plan be developed for any water harvesting system that is designed. An operation plan should include: system plans, maintenance schedule for system components, valve layout and operation diagram, and a cleaning schedule. Visual inspection of the system should occur on a weekly basis to ensure proper operation. Ensure all drains/outlets from the system are protected in a manner that reduces the potential for erosion. Exclude livestock and vehicle traffic from accessing and damaging components of the system. Ensure that the system is winterized prior to the threat of freezing temperatures each winter.

References:

Drinking Water Quality Guidelines for Cattle (ID 170)
http://www2.ca.uky.edu/agcomm/pubs/id/id170/id170.pdf

Kentucky Irrigation and Drought Resources
http://www.uky.edu/WaterResources/assets/docs/pdf/KY.irrigation.resources.6.4.16.pdf

USDA-ARS, Agriculture Handbook No. 600, Handbook of Water Harvesting
https://naldc.nal.usda.gov/naldc/download.xhtml?id=CAT87208954&content=PDF

Water Harvesting for Livestock Systems

http://www.2.ca.uky.edu/agcomm/pubs/AEN/AEN133/AEN133.pdf