Farm Structures and Livestock Facilities

by
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for
Ozarks Ag 101 Short Course
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UNIVERSITY OF MISSOURI Extension
What We’ll Cover

- Farmstead & structures planning
- Animal handling facilities
- Fencing systems & materials
- Watering systems & materials
Planning the Farmstead
Plan for Drainage & Runoff

7 Ideal land slope = 2-6% (1/4”-3/4” per ft.)
7 South slope best for natural drying & livestock feeding, then East, then W or N
7 Ozarks annual rainfall = 41”- 42”
   ▪ Dirt lot runoff = 17,500 gal. per 1000 sq.ft. roof
   ▪ Concrete lot = 26,000 gal. per 1000 sq.ft. roof
7 Control surface runoff with diversions & buffer strips
7 Control subsurface water with curtain drains
7 Average wind speed = 11 MPH
   ▪ Summer breezes blow from SW to NE
   ▪ Odors in still air move downhill like water
Barn Structural Design

- Design for 90+ MPH winds, 25+ psf roof load
  - Embed posts 4+ ft. deep
  - Use ACQ-approved fasteners
- Clear-span construction preferred for flexibility
- Raise floors 8”-12” above outside grade
Barn Structural Design

7 Space at least 50 ft. apart for fire protection
7 Take advantage of solar
   ▪ E-W orientation for buildings
   ▪ N-S for feed bunks & high tunnels
Avoiding DNR Visits

- Keep farmstead neat = positive public image
- Plant grass/tree buffers to filter & hide
- Fence & rotate pastures to reduce animal damage
- Inform neighbors when spreading manure
- Roof (large number) animal traffic areas
- Gutter roof, lot and driveway clean water
- Budget funds and time for the waste system
- Make improvements compatible with DNR regulations
Animal Handling Facilities
Facilities Should….

- Provide for the welfare of animals
- Provide safety for handlers
- Be efficient
- Be cost-effective
Styles of Buildings

- Shed
- Gable
- Offset Gable
- Gambrel
- Gothic
- Monitor
Barn Ventilation

7 Cold barns (natural ventilation)
   - Building width & volume dictates design
     - Summer heat worse than winter cold in the Ozarks
     - Ridge vent = 6” min. + 2” wide opening per 10 ft. building width over 30 ft.
     - 12+ ft. high sidewalls reduce heat load
   - Orient buildings with long axis E-W for best airflow

7 Warm barns (mechanical ventilation)
   - Animal species, number & weight dictates design
   - Match fans to inlets
   - Vapor barriers protect insulation
Sizing Hay Storage

Small Square Bales

250 cu.ft. per ton

Large Round Bales

310 cu.ft. per ton
Planning Handling Facilities

Good Corral Design

- Animal Welfare
- Eff. Animal Flow
- Vet. Access
- Holding & Handling
- Working Area
- Economical Cost
- Animal Charac.
- Vehicle Access
- Good Drainage
- Fencing Materials
- Safety & Security
- Environ. Sound
# Cattle Chute & Fence Specs.

<table>
<thead>
<tr>
<th>Section</th>
<th>&lt; 600 lbs.</th>
<th>600-1200 lbs.</th>
<th>&gt; 1200 lbs or cow/calf</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Holding area, sq.ft./hd</strong></td>
<td>14</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td><strong>Crowding pen, sq.ft./hd</strong></td>
<td>6</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td><strong>Working chute, vertical sides</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td>18 in.</td>
<td>26 in.</td>
<td>28-30 in.</td>
</tr>
<tr>
<td>Length, minimum</td>
<td>20 ft.</td>
<td>20 ft.</td>
<td>20 ft.</td>
</tr>
<tr>
<td><strong>Working chute fence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height of solid lower wall, with 2’-4” open at bottom</td>
<td>48 in.</td>
<td>50 in.</td>
<td>50 in.</td>
</tr>
<tr>
<td>Overall height, quiet/range cattle</td>
<td>55/68 in.</td>
<td>60/72 in.</td>
<td>60/72 in.</td>
</tr>
<tr>
<td><strong>Corral line fence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>60 in.</td>
<td>60 in.</td>
<td>60 in.</td>
</tr>
<tr>
<td>Depth in ground, wood posts with 5 in. top</td>
<td>36-42 in.</td>
<td>36-42 in.</td>
<td>36-42 in.</td>
</tr>
<tr>
<td>Depth in ground, steel posts with 2 in. dia.</td>
<td>30 in.</td>
<td>30 in.</td>
<td>30 in.</td>
</tr>
<tr>
<td><strong>Loading chute</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td>26 in.</td>
<td>26 in.</td>
<td>26-30 in.</td>
</tr>
<tr>
<td>Length, minimum</td>
<td>12 ft.</td>
<td>12 ft.</td>
<td>12 ft.</td>
</tr>
<tr>
<td>Rise, inches per foot</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
</tbody>
</table>
Cattle Psychology 101

1. Each animal has its own personality
   - Respond well to routine; work best in groups
   - Be calm, slow and deliberate

2. Remember painful experiences
   - A.I. and squeeze chute should not be the same
   - Excited cattle may take 20-30 minutes to calm down

3. Natural tendency to circle
   - In order to see other herd members
   - In order to see what is behind them

4. Very sensitive hearing
   - Avoid loud noises
Cattle Psychology 101

1. Can’t judge distances well, esp. w/ heads up
   - Keep wire fences visible
2. See in black & white, limited color (purples)
3. Balk at sudden light changes
   - Avoid bright spots & shadows
4. Need the security of solid walls
   - Avoid pipe fences to move them
5. Can see almost all the way around them
   - Use “flight zone” to move them
“Flight Zone”
An Animal’s Personal Space

Diagram courtesy of Dr. Temple Grandin
Stay Out of Blind Spot
“Flight Zone”
An Animal’s Personal Space

Cattle face handler outside flight zone

Cattle turn away when handler enters flight zone

Photo credits: grandin.com/behaviour/principles/flight.zone.html
Cattle Psychology 101

1. Be patient; never prod an animal when it has nowhere to go
2. Gently touch them instead of shoving or bumping
3. Respect livestock--don’t fear them
4. Always have an escape route from them
Cattle Warning Signs

- Raised or laid-back ears
- Raised tail, raised hair on the back, arched back
- Bared teeth
- Lowered head, shaken side to side
- Pawing the ground or snorting

Relaxed  Pain, scared or cold  Exploring or alert  Galloping
Reduce Distractions

7 Chains that jiggle
7 Clanging or banging metal
7 Air hissing; high-pitched noises
7 Barking dogs
7 Changes in flooring and texture
   ▪ Grates, shadows of pipe fences, etc.
7 Reflections on metal or puddles
7 Cracking whips
7 Air drafts blowing towards approaching animals
Reduce Distractions

7 Unusual movement
   ▪ Fan blades, piece of plastic, people ahead
7 Clothing hung on the fence
7 Small object on the floor
   ▪ Coffee cup, trash
7 Sudden changes in the color of equipment
7 Bright light such as blinding sun
7 Entrance too dark
Reduce Distractions
Reduce Distractions

NOTICE THE DRAIN.

THIS WILL CAUSE LIVESTOCK TO BALK.
Fencing Equipment & Materials
Do I Have to Fence My Property?

7 Yes, if you own livestock
   ▪ Owner is liable for livestock damage on public roadways
   ▪ Owner may be liable for livestock damage to adjoining property

7 Maybe, if you don’t own livestock

7 See MU Guide G810
   extension.missouri.edu/p/G810
What is a “Legal Fence”?

7 2001 Law:
   - Posts and wire or boards
   - At least 4 feet high
   - Posts no more than 12 feet apart

7 “Right-hand rule” for division fence upkeep
   - Tradition became law in 2001
   - Not mentioned in 1963 law

7 Other mutual agreements
   - Should be recorded on both land titles
Types of Fences

- Wood
- PVC / Vinyl
- Barbed wire
- Woven wire
- Livestock panels
- Steel pipe
- High-tensile
- Permanent electric
- Temporary electric
Wood Boards

- Good for all livestock & working areas
- Visually attractive
- Strong
- Labor intensive
- Needs regular maintenance
- Posts 8 ft. o.c.
- Four 1”x6” boards
PVC / Vinyl

- Attractive
- Low maintenance
- High cost ($15+/ft.)
- May not resist aggressive livestock
Barbed Wire

- Good for roads, property lines
- 4 minimum, 5 recommended
- Standard or high-tensile
- Inexpensive & easy to install
- Not recommended for working lots or horses
- Need good corners & braces
Barbed Wire 2
Woven Wire

- Harder to install
- Higher cost
- Need good corners & braces
- Good for working lots

Wire choices
- 6”x12” wire for goats
- 6”x6” for sheep
- V-mesh for horses
  - No barbed wire on top
Livestock Panels

- 16’ rigid lengths
- No stretching required
- Corners & braces not so important
- More posts required
- Good for horses, sheep, goats
- Good for working lots
Steel Pipe

- Usually 3”-4" diameter posts; 2”-3" rails
- Strong
- Safe
- Durable
- Low maintenance
- Good for paddock fencing
- Can be expensive to build
High-Tensile

- Easy to handle
- Safer for livestock
- Strong
- Attractive
- Requires little maintenance
- Easily electrified
Permanent Electric Fence
Permanent Electric Fence

- High-tensile wire on fiberglass posts
- Can be designed for all livestock
- Cheaper and easier to build
- Smaller corners and braces
- Need different tools and equipment
- Dependent on electricity
  - Need charger with 7,000+ volts “turning power”
- Not for lots or working areas
Temporary Electric Fence
Temporary Electric Fence

- Not a legal fence
- Good for dividing paddocks in MIG system
- Cheap and easy to build
- Wire or poly-tape
- Fiberglass or plastic posts
- Steel rods with insulators
- Many things can go wrong
## Comparison of Fence Costs

<table>
<thead>
<tr>
<th>Type</th>
<th>Cost Index*</th>
<th>Approx. Life, Years</th>
<th>Upkeep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood</td>
<td>200</td>
<td>10-20</td>
<td>Medium</td>
</tr>
<tr>
<td>PVC / Vinyl</td>
<td>500-600</td>
<td>20</td>
<td>Low</td>
</tr>
<tr>
<td>Barbed Wire</td>
<td>35</td>
<td>33</td>
<td>Medium</td>
</tr>
<tr>
<td>Woven Wire</td>
<td>75</td>
<td>33</td>
<td>Medium</td>
</tr>
<tr>
<td>Steel Pipe</td>
<td>400-500</td>
<td>35-40</td>
<td>Low</td>
</tr>
<tr>
<td>Hi-Tensile or Perm. Electric</td>
<td>20</td>
<td>25</td>
<td>Medium</td>
</tr>
<tr>
<td>Temporary Electric</td>
<td>7-11</td>
<td>5-20</td>
<td>High</td>
</tr>
</tbody>
</table>

* Cost index figures show relative cost for materials only, not actual costs.
Corners & Braces

1 The most critical part of a good fence
2 Wood posts anchored minimum 3’6” deep
   ▪ Untreated hedge & locust posts last longest
   ▪ P-T pine better than P-T oak
3 Steel must be anchored deeper than wood
4 Brace post should be horizontal
   ▪ See MU Guide G1191 & G1192
## Wood Post Life Expectancy

<table>
<thead>
<tr>
<th>Type of Wood</th>
<th>Untreated</th>
<th>Treated</th>
<th>Type of Wood</th>
<th>Untreated</th>
<th>Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
<td>3-7</td>
<td>10-15</td>
<td>Larch</td>
<td>3-7</td>
<td>10-20</td>
</tr>
<tr>
<td>Aspen</td>
<td>2-3</td>
<td>15-20</td>
<td>Maple</td>
<td>2-4</td>
<td>15-20</td>
</tr>
<tr>
<td>Bald Cypress</td>
<td>7-15</td>
<td>20-25</td>
<td>Oak (red)</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Balsam Fir</td>
<td>4-6</td>
<td>10-15</td>
<td>Oak (white)</td>
<td>10</td>
<td>15-20</td>
</tr>
<tr>
<td>Basswood</td>
<td>2-3</td>
<td>15-20</td>
<td>Osage Orange</td>
<td>20-25</td>
<td>Not necessary</td>
</tr>
<tr>
<td>Beech</td>
<td>3-7</td>
<td>15</td>
<td>Pine</td>
<td>3-7</td>
<td>25-30</td>
</tr>
<tr>
<td>Birch</td>
<td>2-4</td>
<td>10-20</td>
<td>Red Cedar</td>
<td>15-20</td>
<td>20-25</td>
</tr>
<tr>
<td>Black Locust</td>
<td>20-25</td>
<td>Not necessary</td>
<td>Red Mulberry</td>
<td>7-15</td>
<td>15-30</td>
</tr>
<tr>
<td>Box Elder</td>
<td>2-7</td>
<td>15-20</td>
<td>Redwood</td>
<td>10-15</td>
<td>20-30</td>
</tr>
<tr>
<td>Butternut</td>
<td>2-7</td>
<td>15-20</td>
<td>Sassafras</td>
<td>10-15</td>
<td>20-25</td>
</tr>
<tr>
<td>Catalpa</td>
<td>8-14</td>
<td>20-25</td>
<td>Spruce</td>
<td>3-7</td>
<td>10-20</td>
</tr>
<tr>
<td>Cedar</td>
<td>15-20</td>
<td>20-25</td>
<td>Sweetbay</td>
<td>2-6</td>
<td>10-20</td>
</tr>
<tr>
<td>Cotton Wood</td>
<td>2-6</td>
<td>10-15</td>
<td>Sweetgum</td>
<td>3-6</td>
<td>20-30</td>
</tr>
<tr>
<td>Douglas Fir</td>
<td>3-7</td>
<td>15-18</td>
<td>Sycamore</td>
<td>2-7</td>
<td>20-25</td>
</tr>
<tr>
<td>Elm</td>
<td>4</td>
<td>15</td>
<td>Tamarack</td>
<td>7-10</td>
<td>15-20</td>
</tr>
<tr>
<td>Hackberry</td>
<td>3-7</td>
<td>10-17</td>
<td>Tupello (black)</td>
<td>3-7</td>
<td>15-20</td>
</tr>
<tr>
<td>Hemlock</td>
<td>3-6</td>
<td>10-25</td>
<td>Willow</td>
<td>2-6</td>
<td>15-20</td>
</tr>
<tr>
<td>Hickory</td>
<td>5-7</td>
<td>15-20</td>
<td>Yellow Poplar</td>
<td>3-7</td>
<td>20-25</td>
</tr>
<tr>
<td>Honey Locust</td>
<td>3-7</td>
<td>10-20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Corners & Braces

Single Brace Post
Corners & Braces

Double Brace Post
Corners & Braces

Floating Brace Post
Fencing Tools

PTO-powered Auger

Post-Hole Diggers
Fencing Tools

Steel Post Driver

Hand Winch or Come-Along

Clamps for Smooth or Barbed Wire
Fencing Tools

Fencing Pliers

Leather Gloves
Fencing Tools

Spinning Jenny

Voltage Tester
Watering Systems
Water is Critical to Life

7 Ranks second only to oxygen in importance
7 Lack of water or poor quality water can cause:
   ▪ Drop in milk production
   ▪ Reduced conception rates
   ▪ Reduced feed intake
   ▪ Disease & parasite problems
   ▪ Death
Water Consumption Depends on:

- Animal species
- Animal size & age (young more than old)
  - Mature cows = 3-5 lbs. water / lb. of D.M. intake
  - Calves = 5-7 lbs. water / lb. of D.M. intake
- Level of activity
- Air temperature & humidity (hot more than cold)
- Milk production (pregnancy)
- Diet (moisture content of the feed)
- Land topography & distance
# Animal Water Requirement

<table>
<thead>
<tr>
<th>Livestock</th>
<th>Winter gallons/day</th>
<th>Summer gallons/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef cow/calf pairs</td>
<td>13-16</td>
<td>30-35</td>
</tr>
<tr>
<td>Milking cow</td>
<td>30-35</td>
<td>35-50</td>
</tr>
<tr>
<td>Heifers</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Sheep (ewe with lambs)</td>
<td>2</td>
<td>3-4</td>
</tr>
<tr>
<td>Finishing pigs</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Horse</td>
<td>8</td>
<td>12-20</td>
</tr>
</tbody>
</table>
How Beef Cattle Drink

7 If greater than 800 feet to water
   ▪ Herd travels as a group
   ▪ Travel 1-2 times per day to drink
   ▪ Remain longer & drink several times per visit
   ▪ Drink @ 1-2 GPM rate
   ▪ Requires large water reservoir

7 If less than 800 feet to water
   ▪ Breaks up social behavior, cows travel individually
   ▪ Travel 3-5 times per day to drink
   ▪ Drink 1-4 minutes per visit @ 1-2 GPM rate
   ▪ Smaller water reservoir is possible
Water Source Choices

- Ponds
- Springs
- Creeks & streams
- Wells
- Public water systems
Ponds

7 Livestock water source if >8 ft. deep
7 Fishing & recreation
Ponds

7 Must be sized to the watershed
   ▪ 1 acre of pond per 10-15 acres of watershed
   ▪ All Ozarks water comes from rainfall
   ▪ 41”- 42” rainfall & 36” of evaporation annually

7 Frequently go dry in prolonged droughts
   ▪ Pond 8' deep, 100' dia. holds 280,000 gallons of water when full
   ▪ One-half of water volume is usable for livestock water. Rest is seepage & evaporation
   ▪ 100 cow/calf pairs use 3500 GPD
     140,000 gal. ÷ 3500 GPD = 40 day supply
Ponds

7 Suitable pond site may not be a good water distribution point for livestock

7 High risk of leakage due to:
   - Highly permeable red clay soils
   - Shallow depth to bedrock; too much rock (50%+)
   - Poor construction procedures
   - Lack of sealing clays

7 Unrestricted access can cause disease & foot problems

7 Risk of animal drowning through winter ice
Ponds

7. Should be fenced with limited access or have a concrete tank below the dam.
Ponds 5

Highly Permeable Red Clay
Ponds 6

Limestone Outcrops
Ponds

Excessive Rock
Ponds

Poor Sites & Size
Poor Water Quality Due to Shallow Depth
Pond – Sealing

Sheepsfoot Roller
Pond – Sealing

Bentonite Clay and/or Soda Ash
Pond Water Quality

7 Grass filters sediment & nutrients

7 Copper sulfate controls algae & slime
Springs

- Flow usually driven by seasonal rainfall
- Can provide gravity flow if high on landscape
- Upslope springs usually first to dry up in summer
- May be high in sulfur, iron or other minerals
Creeks & Streams

- Flow usually driven by seasonal rainfall
- Water usually good if spring-fed
- Animal access can damage water & stream banks for other uses
- Can be high in sediment
Creeks & Streams

Stream damage from manure runoff & cattle access

“Losing” stream
Wells

7 Water quality usually good in the Ozarks
7 May be high in sulfur, iron or other minerals
7 Expensive to install
7 Water level usually driven by seasonal rainfall

PVC Casing

Steel Casing
Wells

- Almost 100% chance of adequate water
- Can locate for best access to multiple pastures if electricity is near
- Can install pipelines to multiple pastures or locations
- May require larger pressure tank to avoid pump burnout
- Can’t pump water if power goes off
- Costs 9 cents/HP/hour to run pump
Well Installation
Well Installation

Concrete Well House
Public Water Systems

- Water quality is very good
- Supply is reliable, except during major drought
- Cost of water is highly variable
- Some PWDs restrict use by livestock

Photo credit: http://eastcedarcreek.net
Choosing Pumps

- Submersible
- Jet
- Solar-powered
- Windmills
- Nose
- Ram
7. Elevation from pump to tank(s)  
(2.31 feet = 1 psi pressure)
Pipeline Design – Friction Loss

7 Gravity systems
- Limit head to 1.5 ft. per 100 ft. of pipe
- Minimum pipe size = 1¼-inch diameter

7 Pressure systems
- Limit head to 2.3 ft. per 100 ft. of pipe
- Rule of thumb: Pipe diameter x 2 = 4X flow rate

Diagram:
- 5 GPM: 1"
- 20 GPM: 2"
Plastic Pipe Friction Loss
Pipeline Options

7 Polyvinyl chloride (PVC)
- White, rigid 20 ft. lengths
- Glued or slip-in joints
- More labor for installation
- More prone to leaks
- Prone to breakage from rocks & freezing
Pipeline Options

7 Polyethylene (PE)
- Black or white, flexible 100-ft. rolls, fewer joints
- Select UV-stabilized (2% carbon black) pipe
- Use HDPE above ground
- Use LDPE below ground or drain in fall
- More cost, less flow than PVC of same diameter
- Use only brass fittings & stainless-steel clamps
Pipeline Options

7 Pressure ratings
    Use 160 psi pipe for pressure systems
    Can use 100 psi pipe for gravity systems

7 Frostline in southern Missouri
    18-24 inches minimum, cover with 2” rigid foam if less
    30 inches recommended in wet, compacted soil

7 Sleeve pipe through steel pipe under roads for rock protection
Choosing Tanks

- Steel
- Plastic
- Fiberglass
- Concrete
- Others
  - Rubber tires with concrete bottom
  - Cleaned fuel tanks, barrels, large pipes
  - Old aluminum or fiberglass fishing boats
  - Old stainless steel milk tanks
7 If greater than 800 feet to water

- Tank volume = \(\frac{1}{3}\) of daily herd requirement
  - 100 cow/calf pairs = 3900 GPD
    \[3900 \text{ GPD} \times \frac{1}{3} = 1300 \text{ gallon capacity}\]

- Access space = 15 inches per animal \(\times \frac{1}{3}\)
  - 100 cows \(\times \frac{1}{3} \times 15 \text{ in./cow} = 500 \text{ inches}\)
  - 500 in. \(\div 3.14 = 160 \text{ in.} = 13.3 \text{ ft. min. tank diameter}\)

- Which limits?
  - Volume = Dia.\(\times\) Dia. \(\times\) Depth \(\times\) 6
  - Depth = 1300 gal. \(\div (13.3 \times 13.3 \times 6) = 1.2 \text{ ft. depth}\)
  - If tank depth is 2 ft., size is based on access space

- Double perimeter if sharing fence line
Sizing Tanks

7 If less than 800 feet to water

- Tank volume = \( \frac{1}{50} \) of daily herd requirement
  - 100 cow/calf pairs = 3900 GPD
    - \( 3900 \text{ GPD} \times \frac{1}{50} = 80 \text{ gallon capacity} \)

- Access space = 15 inches per animal \( \times \frac{1}{10} \)
  - 100 cows \( \times \frac{1}{10} \times 15 \text{ in./cow} = 150 \text{ inches} \)
  - \( 500 \text{ in.} \div 3.14 = 48 \text{ in.} = 4 \text{ ft. min. tank diameter} \)

- Which limits?
  - Volume = Dia. x Dia. x Depth x 6
  - Depth = \( 80 \text{ gal.} \div (4 \times 4 \times 6) = 0.83 \text{ ft. depth} \)
  - If tank depth is 2 ft., size is based on access space

- Double perimeter if sharing fence line
Cost Estimate – 1/2-Acre Pond
Water 1 or 2 Pastures  (prices as of 3/2015)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2200 cu. yds. earthfill @ $3.48/cu.yd.</td>
<td>$ 7,656</td>
</tr>
<tr>
<td>120 ft. 6” dia. principle spillway pipe @ $4.34/ft.</td>
<td>521</td>
</tr>
<tr>
<td>90 ft. 2” dia. livestock tank pipe @ $1.48/ft.</td>
<td>133</td>
</tr>
<tr>
<td>Concrete tank, installed</td>
<td>1,100</td>
</tr>
<tr>
<td>Gravel pad - 10.4 tons gravel @ $17.93/ton</td>
<td>187</td>
</tr>
<tr>
<td>Fence: 1000 ft. @ $2.01/ft.</td>
<td>2,010</td>
</tr>
<tr>
<td>1 metal gate</td>
<td>135</td>
</tr>
<tr>
<td>Seed and fertilizer - 1 acre</td>
<td>487</td>
</tr>
<tr>
<td>Soda ash: 2000 lbs. @ $0.47/lb.</td>
<td>940</td>
</tr>
<tr>
<td><strong>Total Estimate</strong></td>
<td><strong>$ 13,169</strong></td>
</tr>
</tbody>
</table>
# Cost Estimate - New Well

**Water 4 Pastures** *(prices as of 3/2015)*

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drilling - 425 ft. @ $6.44/ft.</td>
<td>$ 2,737</td>
</tr>
<tr>
<td>Casing - 120 ft. @ $12.00/ft.</td>
<td>1,440</td>
</tr>
<tr>
<td>Well, miscellaneous</td>
<td>430</td>
</tr>
<tr>
<td>Well house</td>
<td>665</td>
</tr>
<tr>
<td>Deep well pump</td>
<td>2,300</td>
</tr>
<tr>
<td>Pressure tank</td>
<td>666</td>
</tr>
<tr>
<td>Concrete tank, installed</td>
<td>1,100</td>
</tr>
<tr>
<td>Gravel pad - 10.4 tons gravel @ $17.93/ton</td>
<td>187</td>
</tr>
<tr>
<td>1320 ft. 1¼“ dia. pipeline @ $1.10/ft. installed</td>
<td>1,452</td>
</tr>
<tr>
<td>1320 ft. of trenching @ $1.55/ft.</td>
<td>2,046</td>
</tr>
<tr>
<td>Seed and Fertilizer - 0.3 acre</td>
<td>144</td>
</tr>
<tr>
<td>Electricity - New or Existing?</td>
<td>???</td>
</tr>
<tr>
<td><strong>Total Estimate</strong></td>
<td><strong>$ 13,167</strong></td>
</tr>
</tbody>
</table>
References

7 MWPS6 Beef Housing & Equipment Handbook
7 MWPS3 Sheep Housing & Equipment Handbook
7 MWPS60 Horse Facilities Handbook
7 MU Guide G810 Missouri Fencing and Boundary Laws
7 MU Guide G1191 Selecting Wire Fencing Materials
7 MU Guide G1192 Constructing Wire Fences
7 M157 Missouri Grazing Manual
7 MWPS-14 Private Water Systems Handbook
7 MU Guide G1800 Sources for Farm and Home Water Supply
7 MU Guide G1801 How to Size a Farm and Home Water System
7 MU Guide EQ380 Pumps and Watering Systems for Managed Beef Grazing
7 MU Guide EQ381 Water Quality for Livestock Drinking
7 MU Guide G1161 All-Weather Concrete Stock Tank
7 NRCS handbook: Electric Fencing for Serious Graziers
7 NRCS handbook: Watering Systems for Serious Graziers
References

7 Get them online at:
extension.missouri.edu/publications
Questions?

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  Washington, DC 20250-9410

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