NCAT's
Organic Livestock Workbook
A Guide to Sustainable and Allowed Practices

NCAT's Organic Livestock Workbook is designed for use by organic and transitional producers with livestock or mixed crop and livestock operations. Producers having certified or transitional cropping enterprises should also utilize *NCAT's Organic Crops Workbook*.[1] This workbook series is intended to be consistent with the requirements of the National Organic Standard.

Rotational Grazing with Holstein dairy cattle, Washington County, Virginia. By Jeff Vanuga. 2002. USDA Natural Resources Conservation

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NCAT

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So here's the scoop…

The Purpose and Use of This Workbook

One of the greatest challenges in organic farming today is understanding and navigating the Organic Regulations. This workbook[3] is designed to help you in this regard. It addresses, among other things, the wide range of practices and materials allowed under the National Organic Standard. Particular emphasis is placed on those farming strategies and practices that promote sustainability.[4] This workbook will be especially useful to producers contemplating conversion to organic production, and to those who are in the early years of transition. If you are a beginning farmer or rancher, or are contemplating conversion to organic production, we encourage you to read this workbook before completing your application for certification. Please note that this is NOT a required document; it is a helpful guide that you may use as you wish. Hint: Your certifier would love to know you are using this workbook for guidance; consider showing it to your inspector.[5]

And speaking of organic inspectors, as you will learn in this workbook, organic inspection is an annual process. The individual who conducts the inspection—the organic inspector—represents the certifying agent. It is the inspector's responsibility to look for documentation and indicators that bear out the producer's claim to organic status, as well as to look for any violations. To succeed at their job, organic inspectors are trained to look critically at all aspects of an organic operation; few details escape their notice. This workbook presents an inspector's perspective and attempts to address all of the different areas that inspectors investigate while visiting a livestock operation.

Much of the useful information in the workbook is presented as brief discussions. Numerous endnotes are provided; most of these suggest further sources of information. You will also find a number of questions at the end of each section, which serve as a checklist for sustainable practices and for preserving organic integrity. There are a number of questions that draw particular attention to areas that may affect eligibility for certification. In most instances the pertinent section and paragraph of the Organic Regulations will be shown in brackets, for example, [§205.203(c)].

Consider each of the questions carefully and place a check in the appropriate "Yes," "No," or "Not Applicable (n/a)" box. Providing answers that accurately reflect your current circumstances will be the most helpful to you—honesty will be your best policy. Ideally, you will have most of your checks in the "Yes" boxes.

If you want to make optimum use of this workbook as a guide to information sources, try using the electronic versions (.html and .pdf) of the workbook that can be found on the ATTRA website at <http://www.attra.ncat.org>. The workbook is featured under the section on organic farming. The publications referenced in the endnotes are mostly free-of-charge resources accessible on the World Wide Web, and are active hypertext links. Clicking on any of these links will "jump" you immediately to that resource. But be aware, electronic addresses can change. If a link does not work for you, submit your request to the appropriate entity—State Cooperative Extension Office, ATTRA, or other. A contact list for the primary information providers and Extension Publication Offices can be found toward the end of the workbook.

Please note that some resources listed in the endnotes may not be fully consistent with the National Organic Standard. For example, Cooperative Extension Publications on organically acceptable pesticides often include nicotine, which is now specifically prohibited. When you have a question about whether any practice or product is allowed in organic production, CONSULT YOUR CERTIFIER. This is advice we will frequently give throughout this workbook.

I. Organic Agriculture in America

There are many notions of what organic agriculture is. In 1995, the National Organic Standards Board defined it as "an ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain and enhance ecological harmony."

The legal definition, provided in the National Organic Program Regulations, states that "Organic production [is] a production system that… respond[s] to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biological diversity" [§205.2]. While these definitions are helpful, they have more meaning when one considers them in light of how organic farming and the organic marketplace evolved.

Contemporary American organic farming has its roots in the humus[6] farming movements that proliferated in Great Britain and Continental Europe from the 1920s through the 1950s. These movements evolved largely in response to the increasing use of synthetic fertilizers. The proponents of humus farming believed that the highest quality food and the sustainability of agriculture were achieved through systems and techniques that built and enhanced the living organic or humus complex of the soil. Humus farming was typified by mixed farms that had both livestock and crop enterprises; they featured cropping schemes that included both food and feed crops, plus legume and grass forages and green manure crops. Humus farming made little or no use of soluble commercial fertilizers or pesticides, in good part because they were not needed and could even be counterproductive in systems so-modeled on nature.[7]

The 1960s and 1970s brought more visibility to organic farming as public concern over pesticide use increased. The non-use of synthetic pesticides eventually became a major focus of organic agriculture as demand for organic products grew, creating an industry out of a practical philosophic movement. Organic industry growth led to the establishment of standards and third-party certification to ensure consistency and enhance credibility.

As the industry expanded during the 1980s, disparities among certifier standards, barriers to trade, and incidents of fraudulent marketing led many to believe that more regulation was needed. Finally, in 1990, Congress passed the Organic Foods Production Act (OFPA).[8] The OFPA mandated creation of the National Organic Program (NOP) and an advisory body, the National Organic Standards Board (NOSB). The OFPA paved the way for creating a single set of US standards for organic production, labeling, and marketing, which now exists in the form of the National Organic Program Regulations, a.k.a. the National Organic Standard.[9] Many other countries, such as the European Union and Japan, have their own organic standards for products produced in or imported into their countries. US organic producers planning to export their products must take these standards into account when certifying their operations.

II. Certification

Certification under the National Organic Program is the license to label, represent, and market your products as organic. Certification can be obtained from state or private certifiers that are accredited through the National Organic Program and who act as its licensing agents.[10]

Under the NOP Regulations, all operations or portions of operations that produce or handle agricultural products that are intended to be sold, labeled, or represented as organic must be certified. Noncertified producers who represent themselves or their products as organic risk prosecution and fines.

A three-year conversion period is required to achieve full organic status. In other words, no prohibited substances may be applied to the land for 36 months prior to the harvest of any product that will be labeled or otherwise represented as organic [§205.202(b)].

If you are purchasing or renting land that is not currently certified and you wish to document that it has not had prohibited substances applied, you must obtain verification from the previous landowner or manager.[11]

Annual inspections are part of the certification process. The inspector is an agent of the certifier. It is the inspector's responsibility to look for documentation and indicators that bear out the producer's claim to organic status, as well as to look for any violations. You must allow the inspector complete access to your operation, including all production facilities and offices [§205.400(c)]. Additional inspections may be announced or unannounced at the discretion of the certifier or the state organic program [§205.403(a)(2)(iii)].

Once certification has been granted, it is granted in perpetuity unless surrendered, suspended, or revoked. For certification to continue, annual certification fees must be paid, the Organic System Plan (see section IV of this workbook) must be updated yearly, and previous non-compliances must be addressed [§205.406].

Any action to suspend or revoke certification must be handled in the manner prescribed in the Standard in §205.660–§205.664. If the status of your certification is threatened and you wish to dispute it, the process for seeking mediation is specifically covered under §205.663. Further details of these provisions will not be addressed in this workbook, but you should be aware that a formal grievance process exists.

Producers who market less than $5000 of organic products annually are not required to apply for organic certification. They must, however, comply with the organic production and handling requirements of the National Standard. The products from such noncertified operations cannot be used as organic ingredients in processed products that are sold, labeled, or represented as organic by another operation; such noncertified products are also precluded from displaying the USDA organic seal.

It is important to recognize that organic certification addresses the ***process*** involved in producing and handling a product. Organic certification assures the consumer that the product was grown using organic methods, that harmful or dangerous pesticides, fertilizers, and genetically engineered organisms were not used in production, and that precautions were taken to prevent contamination from the outside. It does not guarantee that the product is completely free of all pesticide residues or GMO contamination. (The vast proliferation of pesticides and GE crops precludes virtually everyone from making such a claim.) Organic certification also does not ensure that the products are nutritionally superior.[12] However, organic farmers and consumers firmly believe that organic food and feed is healthier, and that organic production is better for the environment.

2.1	***Do you have a copy of the National Organic Standard[13] and/or the standards of your certifying agency readily accessible as hardcopy or "bookmarked" on your web browser?***	☐ Yes ☐ No ☐ n/a
2.2	***Is/Are your certifier(s) accredited by the National Organic Program?***	☐ Yes ☐ No ☐ n/a
2.3	***Did you advise your certifier(s) of any previous applications for certification, including the names of the certifiers, dates of application, and the outcomes of those applications [§205.401(c)]?***	☐ Yes ☐ No ☐ n/a
2.4	***If you are updating your certification, have you addressed any and all non-compliance issues and conditions previously noted by the certifying body [§205.401(c)]?***	☐ Yes ☐ No ☐ n/a
2.5	***Have you discussed any previous suspensions or denials of organic certification with your certifier [§205.401(c)]?***	☐ Yes ☐ No ☐ n/a

Notes on Certification

III. Overview of Organic Livestock Systems

Traditional Organic Livestock Systems. Historically, livestock have always played a key role in organic production systems. During the formative years of the organic movement (the 1920s through the 1950s), the typical organic farms of Great Britain, Continental Europe, and North America integrated livestock production with the growing of both food and feed crops. Livestock provided manure, which is one of nature's best fertilizers and a good means for recycling nutrients within a crop rotation. Growing livestock feed alongside food crops diversified rotations; since forage legumes and sod-forming grasses are among the best feeds for ruminant livestock, these soil-building crops naturally became part of long sustainable cropping sequences. In such systems, livestock could also be fed cull vegetables, weather-damaged crops, crop residues, "alternative" grains and forages, and cash crop grains during years of low

prices. Traditional organic farming systems such as these migrated to the US and remain today. They are common throughout the upper Midwest, with beef, hogs, and dairy cattle as the principal livestock components, and corn, soybeans, small grains, and hay as the principal crop enterprises. Such traditional farms have been the subject of much study over the past few decades. When contrasted with comparable conventional farms they were found to use less fossil fuel energy, lose less soil to erosion, generate fewer groundwater pollutants, and have less impact on global warming—all characteristics of a more sustainable approach to agriculture.[14]

In this traditional organic model as it is practiced today, ruminant livestock have access to pasture, and confinement is allowed only on a temporary basis. Non-ruminants (hogs, for example) might be pastured, and varying degrees of limited and ***temporary confinement*** are commonly used. In most instances, these traditional models adhere easily to the National Organic Program Regulations.

Grazing systems might also be considered traditional organic livestock systems. Grazing systems exist in stark contrast to conventional confinement systems where all feedstuffs are harvested, transported, and bunk-fed to the livestock. In grazing systems, livestock go where the feed grows and harvest it themselves. This typically yields savings in both energy and equipment expense. Since most planned grazing systems are legume and grass forage-based, they also have less erosion and lower production input costs. Because grazing systems naturally afford livestock access to the outdoors, sunlight, fresh air, and exercise, and because manure is distributed naturally, grazing systems generally have few problems complying with the NOP Regulations. The principal challenge appears to be successful organic management of internal parasites. While most grazing systems might be classed as traditional, noteworthy contemporary strategies include management intensive (rotational) grazing[15] and pastured poultry production.[16]

Text Box 3A

When Pasture is Pasture… or Not

The National Organic Standard defines pasture as "[l]and used for livestock grazing that is managed to provide feed value and maintain or improve soil, water, and vegetative resources" [§205.2]. Dry lots, which have little or no vegetation, do *not* meet the NOP definition of pasture; neither does overgrazed pastureland, since overgrazing degrades "soil, water, and vegetative resources." Since §205.239(a)(2) requires that ruminants have access to pasture, the NOP definition of pasture works to ensure that farms and ranches not exceed the carrying capacity of their land because the resulting overgrazing risks damage to the natural resource base. It is OK to provide certified organic green chop, hay, and other feedstuffs, but this does not preclude the need to provide pasture access to ruminant stock. Certifiers and their inspector representatives are likely to question the certifiability of any system that maintains more ruminant stock than can be sustained on the available grazing acreage, under typical seasonal constraints.

Alternative Organic Livestock Systems—Semi-Confined. Nontraditional models of organic livestock production featuring limited confinement have evolved in recent years. Among these alternatives are specialized semi-confined production systems with little or no landbase. Such systems resemble conventional confinement production, but are typically less crowded and allow the livestock access to the out-of-doors, to fresh air, and to sunlight. Semi-confined / non-landbase systems are allowed under the NOP Regulations for non-ruminant livestock production and may be used for ruminants on a temporary basis (see below).

A major challenge faced by semi-confined / non-landbase systems is the handling of manure. According to the NOP Regulations, manure must be managed "in a manner that does not contribute to contamination of crops, soil, or water by plant nutrients, heavy metals, or pathogenic organisms and optimizes recycling of nutrients" [§205.239(c)]. Production systems that do not have growing crops to fertilize must dispose of manure in an environmentally sound manner that ensures recycling of the nutrients it contains.

Another major challenge for semi-confined / non-landbase systems is the acquisition of sufficient quantities and variety of organic feeds[17] and bedding, since these are not produced on-farm. It is hoped that this problem will solve itself as organic production of feed grains and hay expands nationally.

Temporary Confinement. Full confinement of livestock is allowed ONLY on a temporary basis in organic production [§205.239(b)]. The circumstances under which temporary confinement is permitted are specific:

- to protect animals from inclement weather
- to accommodate the needs of a particular stage of production
- to ensure the health, safety, and well being of the animal
- to protect soil and / or water quality

Text Box 3B

A Pattern for Health and Sustainability

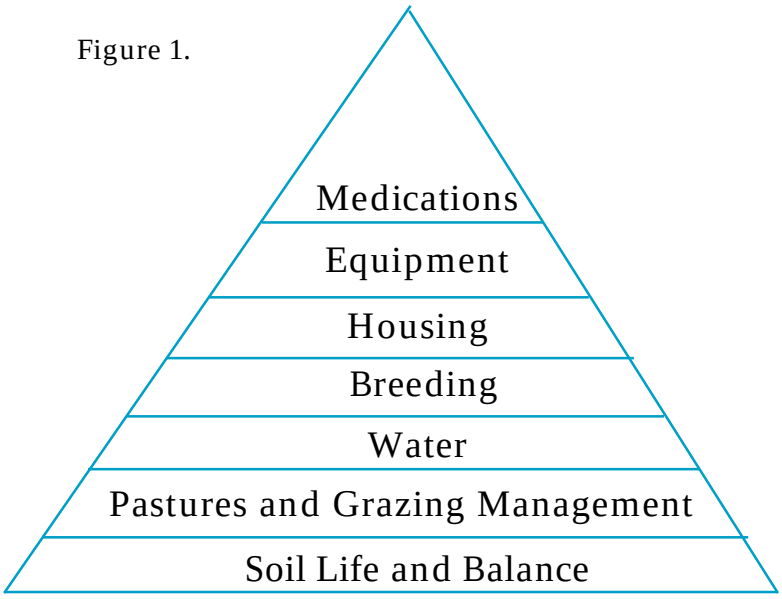
As organic agriculture moves into the mainstream of commerce and culture in the United States and growing emphasis is placed on issues of compliance and marketing, we often lose sight of those aspects of organics that make it attractive and worthy of pursuit. One of the most compelling aspects is system health. It is well-known that most organic farmers and ranchers take pride in the health of their livestock and brag openly about how much they save on veterinary costs. Health management is not relegated solely to medical treatment of sick animals, but to the creation of a whole system that draws from the lessons of nature and optimizes livestock welfare; a system that not only minimizes the hazards of disease, but supports a strong natural immune response in those instances where stress and pathogens occur.

The strategies that support this arise from an organic philosophy that traces human and animal health back to the soil and sees it as the foundation on which a healthy system must be built (see Figure 1 in this section). Furthermore, organic management does not seek maximum production; it does not push livestock above and beyond the natural and healthy levels of performance. Rather, organic husbandry seeks its payoff as a benefit from enhancing and optimizing the health of the flock, the herd, the soil—the whole farm system. Traditional organic systems—as described in the main text—reflect these strategies and philosophy. In the hands of good stewards, traditional organic systems are essentially healthy, though they can always be improved upon—a good example being the integration of improved pasture grazing management.

Major problems in organic livestock production tend to appear when producers attempt to adapt confinement livestock production to organics by merely "tweaking" the system. These folks might meet the minimum regulatory requirements, but they will always be challenged by animal health issues and the associated costs of treating sick livestock or sustaining high death losses.

The health of a good organic system is not only reflected in the economic sustainability of the operation, but also in its environmental sustainability. This is especially true as regards manure management and nutrient recycling. Figuring out what to do with all that manure is much less of a problem when the production system is land-based; there is not only a place for it to go, but all that waste becomes valuable fertilizer.

Figure 1.



The Organic Concept of Animal Health through the Eyes of a Veterinarian. Adapted from Ann Wells, DVM (NCAT), 2003. Originally adapted from Johnson, in Benson & Zirkel's *Organic Dairy Farming*, 1995.

☐ Yes ☐ No ☐ n / a 3.1 ***Does your production system allow access to the out-of-doors, sunlight, fresh air, and exercise space for all your livestock [§205.239(a)(1)]?***

☐ Yes ☐ No ☐ n / a 3.2 ***Does your production system allow access to pasture for all ruminant livestock under usual conditions [§205.239(a)(2)]?***

☐ Yes ☐ No ☐ n / a 3.3 ***If you use temporary confinement, does it meet the criteria of the National Standard [§205.239(b)]?***

Notes on Livestock Systems

IV. Organic System Plan

In comparison to many of the industry standards that preceded it, the National Organic Standard is much less prescriptive—that is, it tends to characterize what an organic operation should be like in general terms and leaves the details for producers and certifiers to work out. The principal tool for working out such details is the *Organic System Plan*.

Under the National Organic Standard, each certified organic farm or ranch must have an Organic System Plan (OSP), also referred to as the *organic farm systems management plan* or the *organic production and handling system plan*. The OSP is a detailed outline that explains how you intend to operate your farm or ranch to satisfy the requirements of the NOP Regulations. According to §205.201(a) of the National Standard, the OSP must contain:

- a description of farm practices and procedures to be performed and maintained, including the frequency with which they will be performed;
- a list of each substance to be used as a production or handling input, indicating its composition, source, location(s) where it will be used, and documentation of commercial availability, as applicable;
- a description of the monitoring practices and procedures to be performed and maintained, including the frequency with which they will be performed, to verify that the plan is effectively implemented;
- a description of the record keeping system implemented to comply with the requirements established in §205.103; (See Text Box 4A in this section.)
- a description of the management practices and physical barriers established to prevent commingling (see Text Box 4B in this section) of organic and nonorganic products on a split operation and to prevent contact of organic production and handling operations and products with prohibited substances; and
- additional information deemed necessary by the certifying agent to evaluate compliance with the regulations.

Text Box 4A

Requirements for Recordkeeping

§205.103 deals with the requirements for recordkeeping by certified operators. The records must:

1) be well-adapted to the business being conducted,
2) disclose all activities and transactions in adequate detail,
3) be maintained for not less than five years beyond their creation, and
4) be sufficient to demonstrate compliance with federal regulations.

Your records must also be available for inspection and copying during normal business hours by authorized representatives of the Secretary of Agriculture, the State Organic Program, and/or the certifying agent [§205.103(c)].

Text Box 4B

Coming to Terms

Contamination can be defined as contact or pollution with a prohibited substance; for example, conventional pesticides, GMO pollen.

Commingling is the physical contact and possible mixing of an organic product with a similar conventional product.

Transitional land is acreage that has been managed organically for less than 36 months. Because the term "transitional" does not have legal status in the National Organic Standard, crops harvested from transitional land may not be sold, labeled, or represented as "transitional;" neither may livestock that have been fed transitional feeds. The status of such crops and livestock is, for all intents and purposes, conventional.

Split production farms are those that produce both organic and nonorganic products (nonorganic includes transitional products).

Parallel production is essentially a subset of split production. The term is used to describe a situation where the same crop or type of animal is produced both organically and nonorganically on the same farm operation.

Paddock is a grazing unit in management intensive or rotational grazing systems. However, for the purposes of this workbook, paddock will simply refer to any pasture, field, or range unit where any form of grazing is practiced.

Grazier is the term used to refer to one who manages grazing animals. *Grazer* (note the slight difference in spelling) is used to describe the grazing animal itself.

The OSP must be written by the producer and agreed to by the certifier. It must reflect all current production methods and all materials that will be used. Producers should use the OSP to explain and rationalize practices they feel they need to manage effectively—especially those which may not have clear acceptance in the National Standard. For example, physical alterations (castration, ear notching, nose rings, branding, beak trimming, etc.) are not provided blanket approval, though some organic producers may have used them for years. These producers can use the OSP to make their case for such practices, explaining why each practice is necessary, how it affects the animal's welfare, and how it will be done to minimize stress and suffering. The certifier can then decide whether each practice complies with the Federal Standard.

The OSP should also address future intentions and improvements. The OSP can be a vital tool for good organic management while ensuring compliance with the National Standard.

Should you need to deviate from the OSP that you have agreed upon with your certifier, it is imperative that the certifier be advised [§205.406(a)(1)(i)]. It is required that you consult your certifier about planned changes in advance [§205.406(a)(1)(ii)]. An annual update of the plan is a requirement for continuation of certification [§205.406(a)(1)].

It is standard practice for the OSP to be incorporated in the *application for certification*, which is required by certifiers at the outset. In other words, you are completing your OSP at the same time you are filling out your application for certification. In such instances, a separate System Plan document is not required. There may also be some instances in which plans submitted to qualify for federal aid or assistance programs may satisfy the requirement for an Organic System Plan [§205.201(b)].[18]

An accurate map of all farm or ranch acreage and production units is typically required as part of the OSP.[19] Important map features:

- consistent scale (Farm Service Agency photo maps may be used)
- permanent field, pasture, or paddock numbers or names
- permanent housing unit numbers
- feed storage areas
- buildings, roadways, and similar features
- hydrologic features: wells, rivers, ponds, irrigation ditches, springs, major drainages, waterways
- field boundaries and adjoining land use
- buffer zones
- contiguous non-production areas under your ownership or management (for example, wildlife habitat, woodlot, etc.)

Field or rangeland histories are also required as part of the OSP. Field histories should document:

- field or paddock size
- vegetation, crops and/or cover crops for current and previous years (three-year minimum)
- all inputs used for current and previous years (three-year minimum)
- field or paddock status (Organic, Transitional, Conventional) for previous years (three-year minimum)

One of the realities of organic farming under the Federal Standard is the expected increase in the number of operations that feature both organic and conventional production. The terms *split* and *parallel* are commonly used to describe such farms (see Text Box 4B in this section). Many certifiers require that field histories and other records cover conventional as well as organic management on split and parallel operations. It is important that the OSP addresses all hazards of contamination and commingling that may arise. Prior to the development of the National Organic Program Standard, a number of certifiers required that split operations have a long-term plan for full conversion to organic. There is no such requirement in the National Organic Program Regulations.

4.1 ***Have you completed your Organic System Plan (OSP) [§205.201(a)]?*** ☐ Yes ☐ No ☐ n/a

4.2 ***Has your OSP been approved by your certifying agent(s) [§205.201(a)]?*** ☐ Yes ☐ No ☐ n/a

4.3 ***Is your farm or ranch map complete and accurate?*** ☐ Yes ☐ No ☐ n/a

4.4 ***Have you completed a field/rangeland history sheet?*** ☐ Yes ☐ No ☐ n/a

☐ Yes ☐ No ☐ n/a 4.5 ***Are the numbers/names used on your map consistent with those used on field histories and other records?***

☐ Yes ☐ No ☐ n/a 4.6 ***If your production unit features a number of pens for segregating livestock, are those pens permanently numbered?***

☐ Yes ☐ No ☐ n/a 4.7 ***Do you have a complete map of your production facility featuring pen numbers?***

Notes on Organic System Plan

V. Adjoining Land Use

Organic livestock—as well as the crops they eat—must be protected from contamination by prohibited substances used on adjoining lands. The most common concerns are pesticide drift and fertilizer runoff. In recent years, pollen drift from genetically engineered crops has also become an issue. See Text Box 5A in this section of the workbook.

Contamination prevention for organic systems usually requires a multi-pronged approach. Strategies may include one or more of the following:

- isolation. Fields, farms, and ranches that are remote or are located at substantial distances from conventional production, roadside spraying, or industrial uses are considered to be adequately protected.
- barriers. Hedges and woods serve as barriers to air- and water-borne contaminants.
- buffer zones. It is common practice for organic producers to designate a buffer zone along borders or property lines where adjoining land and livestock are conventionally managed. Crops harvested from buffer zones, even though organically grown, must be treated as conventional. Organic livestock may not graze buffer areas and may not be fed buffer zone crops.
- drainage diversion
- posting of property (for example, signage reading "Organic Farm: Do Not Spray," etc.)[20]

- formal notification. Written notification is provided to neighbors, utilities, and authorities that manage adjoining lands and rights-of-way requesting cooperation to reduce contamination. You may need to assume responsibility for weed control on roadsides and rights-of-way as part of any resulting agreement. Copies of formal notification letters must be kept on file.[21]
- verification of adjoining land use. A signed statement by the owner or manager of adjoining land serves as acceptable documentation.[22]

The use of buffer zones has a long history in certified organic production. Traditionally, such buffers were defined by width only, with 25 feet being the common distance specified in most certifier standards. The National Organic Program Standard does not specify the required width for a buffer zone, it speaks only to the need to minimize contamination. Therefore, the width (and height, in some instances) of buffers may need to be adjusted for individual circumstances, for example, a more significant buffer is needed where adjacent land is sprayed by plane or helicopter.

If your certifier suspects that your pastures or feed crops are contaminated, residue testing may be required. If residue levels exceed 5% of the EPA tolerance levels, the feed can no longer be considered organic [§205.671]. Note that residue testing is not an accepted substitute for buffer zones or other strategies to prevent contamination. It can, however, serve as an indicator that those strategies are effective.

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Text Box 5A

Genetic Engineering (GE) and Genetically Modified Organisms (GMOs)

Genetic engineering is considered an *excluded method* in the National Standard. §205.2 defines excluded methods as

> a variety of methods used to genetically modify organisms or influence their growth and development by means that are not possible under natural conditions or processes and are not considered compatible with organic production. Such methods include cell fusion, microencapsulation and macroencapsulation, and recombinant DNA technology (including gene deletion, gene doubling, introducing a foreign gene, and changing the positions of genes when achieved by recombinant DNA technology). Such methods do not include the use of traditional breeding, conjugation, fermentation, hybridization, in vitro fertilization, or tissue culture.

Genetic engineering is a new feature of the agricultural landscape, and the organic community is still coming to grips with it. Clearly, organic producers are not allowed to market genetically engineered animals as organic, and genetically engineered biopesticides, probiotics, medications, and the like may not be used in organic production. Organic livestock feed may not be derived from GE crops. Since genetically engineered crops are not allowed in organic crop production, organic feed, ostensibly at least, is non-GMO by default. However, there is a danger of GMO contamination of organic feed crops. At the time of this writing there are no genetically engineered forage crops on the market, so pasture-based production is not unduly affected. Organic grains—especially corn—are the most heavily contaminated. While this has become a serious issue in export of organic food grain products, it is not a top-drawer concern with respect to domestic organic livestock feed at the present. That may change in the future and producers should be aware of it. If you grow grain crops as organic feed, you must take steps to prevent contamination. Guidelines for preventing genetic drift from GM crops to organic fields are being evaluated.

☐ Yes ☐ No ☐ n/a 5.1 ***Are all fields and paddocks well isolated or provided with buffers to prevent contamination [§205.202(c)]?***

☐ Yes ☐ No ☐ n/a 5.2 ***If there is danger of contamination from adjoining land use, are you taking steps to minimize the risk [§205.202(c)]?***

☐ Yes ☐ No ☐ n/a 5.3 ***Have you notified your certifier(s) of any drift or misapplications of prohibited substances to any field, production unit, site, facility, livestock, or product that is part of the organic operation [§205.400(f)(1)]?*** If serious drift contamination occurs, you should also contact your State Department of Agriculture, which has (or should have) the responsibility to follow up on such matters.[23]

☐ Yes ☐ No ☐ n/a 5.4 ***Have you consulted your certifier to learn if there are specific requirements for buffer zones or other matters relating to adjoining land use?***

Notes on Adjoining Land Use

VI. Supporting BioDiversity

The National Organic Standard defines organic production as a production system that "respond(s) to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity" [§205.2]. Aside from an additional mention of "biological diversity" in the definition of crop rotation, the practice standards do little to highlight biodiversity as something to be measured and monitored.

Biodiversity is a principle of sustainable agriculture and an important indicator of a healthy organic farm or ranch.[24] It plays a particularly crucial role in insect pest management. Diverse agricultural systems support strong populations of predators and parasites that keep pest populations at manageable levels.

Pasture-based livestock systems, and those based on mixed crop and livestock production, possess the basic elements for developing a sound diverse agroecosystem. Specialized production systems with limited land base will have a more difficult time designing their systems to support biodiversity.

One of the more common means through which farmers and ranchers promote biodiversity is by establishing and maintaining forage diversity in their pastures and range. One of the more interesting variations on this concept found in humid regions is herbal pastures or *leys*. Herbal pasturing differs sharply from the conventional notion that a productive pasture must feature only one or two useful forage plant species. Herbal pastures contain a number of non-traditional forage species and plants, many of which would be considered weeds in conventional systems. The majority of these plants—such as forage chicory—are broad-leaved, tap-rooted plants (sometimes referred to as *forbs*) that provide diverse nutrition to the livestock, capture and recycle nutrients from the subsoil, and draw beneficial insects to the field. A diversity of plant species also stabilizes the pasture ecosystem against environmental stress. If one or more of the forage species is wiped out by drought, disease, over-grazing, or another factor, the remaining species survive to ensure a source of feed and protect the soil.[25]

Properly grazed and managed pastures become increasingly biodiverse on their own. This is the natural process of succession as it would occur in a prairie environment grazed by buffalo or other wild herbivores.

In mixed crop and livestock systems—where pasture and forage crops are grown as well as grains—strategies for biodiversity include crop rotation[26] and the use of cover crops.[27] Organic producers who manage such systems also seek to reduce the frequency of tillage to aid in conserving the diversity of soil organisms.[28]

A diversity strategy that is drawing increased attention is *agroforestry*. Agroforestry is the integration of tree crops with livestock or crop production. The term *silvopasture* specifically describes agroforestry systems that combine grazing with tree farming.[29]

Further means by which organic livestock producers promote biodiversity include:

- multi-species grazing[30]
- limiting the use of botanicals and other natural-but-broad-spectrum pesticides
- introducing beneficial organisms in the form of soil or compost inoculants, as beneficial predators and parasites, or as pollinators
- establishing habitats for beneficial insects and wildlife[31]
- adjusting the timing and frequency of mowing and grazing to accommodate nesting birds and other wildlife
- providing roosting, nesting, or sheltering structures such as bird or bat houses
- diversification of farm enterprises

6.1 ***If you produce both livestock and crops, have you implemented a crop rotation that integrates your enterprises effectively with good nutrient cycling and pest management?*** §205.205 of the Regulations requires that crop rotation be used whenever annual crops are produced organically. ☐ Yes ☐ No ☐ n/a

6.2 ***Are you providing non-crop areas as habitat for beneficial insects and wildlife?*** ☐ Yes ☐ No ☐ n/a

☐ Yes ☐ No ☐ n/a 6.3 ***Have you considered adding more enterprises to your operation?***

Notes on Biodiversity

VII. Organic Soil Management for Pasture and Hay Crops

The discussion provided here is brief and does not make clear how fundamentally important soil management is to a working organic system. There are many excellent books on the subject, but to get a good perspective, see ATTRA's *Sustainable Soil Management* at <http://www.attra.org/attra-pub/soilmgmt.html> and the University of California publications *Soil Management and Soil Quality for Organic Crops* at <http://anrcatalog.ucdavis.edu/pdf/7248.pdf> and *Soil Fertility Management for Organic Crops* at <http://anrcatalog.ucdavis.edu/pdf/7249.pdf>.

Organic agriculture is built around the notion that providing nutritious food and feed is the best way to improve and sustain the health of people and livestock, and that the best way to grow nutritious food is by emulating nature, which begins with feeding the organisms of the soil. Soil micro-and macro-organisms are the external digestive system that processes organic matter, delivering a smorgasbord of minerals, vitamins, and other nutrients to the crop at a metered pace. This is in contrast to the conventional approach where crops are flooded with a limited number of soluble fertilizer nutrients, leading to "luxury consumption," imbalanced plant nutrition, and a susceptibility to disease and attack by insect pests.

The food that soil organisms need to do their job comes in the form of organic matter. Thus composting, manuring, green manuring, and similar activities are the standard practices of organic crop production. Good rotational grazing management provides comparable humus development, through the sloughing-off of roots when plants are grazed or mowed, and through the natural deposition of manures. In addition, since there is little-to-no tillage, humus accumulation is encouraged.

Nitrogen is the limiting nutrient on most organic farms. The most economical source of nitrogen is from legumes. Biological nitrogen fixation in legumes results from a symbiotic relationship between the plant and rhizobium bacteria. Rhizobium bacteria "infect" the roots of legumes, forming nodules. The bacte-

ria then fix nitrogen from the air as proteins, which are shared with the legume host and adjacent plants. In organic grain production, forage legumes are included in rotations because they fix enough nitrogen to supply the needs of one or more subsequent seasons of non-leguminous crops. In pasture-based systems, legumes are commonly intercropped with grasses, to provide them with nitrogen. In humid regions many producers adjust liming and fertilization to meet the needs of the legumes in their forage mixes. Thus, legumes become the primary source of nitrogen to drive the system; additional manures and other organic fertilizers may then be applied according to the need for other nutrients like phosphate and potash. This reduces the problem of soil nutrient overloading that frequently occurs when farms import and apply large quantities of manure over many years.

The inoculation of legume seed may be necessary to optimize nitrogen fixation. If you have observed good nodulation on the same legume crop in the last three to five years, re-inoculation may not be necessary. If inoculation is required, rhizobium inoculant can be purchased for this purpose. Be certain you are requesting an inoculant appropriate to the kind of legume you are planting. Also, be certain that you specify a rhizobium product that does not contain genetically engineered material.

Organic growers have also learned the value of providing additional mineral nutrition—commonly in the form of lime, gypsum, and other rock powders—where nutrient deficiencies are not fully addressed by humus building practices. In circumstances where specific micronutrient deficiencies are found, certain forms of synthetic micronutrients may even be used. When synthetic micronutrients are applied, their use must be justified to the certifier. A soil test or audit is the most common means of determining and documenting that a deficiency exists. Note that this requirement for testing does not apply to materials that are naturally rich in a spectrum of micronutrients (glacial gravel dust, greensand, kelp meal, etc.), though soil auditing is still advisable in guiding their use.

The organic community is divided as to what constitutes a good soil test and good soil test recommendations. There is general consensus that, at the very least, the primary nutrients phosphorus and potash, pH, and organic matter should be monitored, though additional specific testing is required to identify micronutrient deficiencies. There is a growing segment of organic producers—especially livestock producers—that feels a good analysis must include cation exchange capacity and cation base saturation; that lime and potash recommendations will not be accurate without them, and that animal health weighs in the balance.[32]

A degree of perspective is required when managing organic soil fertility. Many of the inputs organic market farmers might employ (seed meals, kelp meal, fish emulsion, etc.) are not likely to be economical for fertilizing most forages. New producers should not become confused and think that such costly materials are necessary and should not fall into the "input substitution" trap. Examples of practical and cost-effective tools and strategies are provided in the questions that accompany this section. Still, many farm and ranch operations will need or benefit from some purchased "natural" fertilizers and amendments, especially during transition. With time, however, well-designed organic systems become progressively more self-reliant and require fewer off-farm inputs. This is true of all organic systems, but especially true of livestock systems, where manure recycling works to close the loop of nutrient supply and demand.

Another factor that is not often discussed when it comes to organic soil management is compaction. Compaction can occur on the soil surface and is evident as crusting; it can also occur as a sub-surface problem and is often called *plowpan*. In cropping systems, compaction is usually a symptom of excessive tillage or field operations that were done when the soil was too wet. In pastures, compaction can also be caused by grazing or field operations when the soil is too wet. It is appropriate for graziers to temporarily confine livestock when pasturing can lead to excessive soil compaction.

☐ Yes ☐ No ☐ n / a 7.1 ***Have you taken the time to learn about your soil resource?*** Do you know its classification(s)? Erodability potential? Have you studied NRCS soil maps?

☐ Yes ☐ No ☐ n / a 7.2 ***Do you test your soils on a regular basis?***

☐ Yes ☐ No ☐ n / a 7.3 ***Do you keep your current and past soil test results on file and use them to monitor the effects of your farming practices?***

☐ Yes ☐ No ☐ n / a 7.4 ***Do you make fertility management decisions based on soil test, tissue test, or other nutrient test results [§205.601(j)(6)]?***[33] Remember, application of concentrated micronutrients (sulfates, chelates, etc.) may be made only if the need is documented by soil or tissue tests.

☐ Yes ☐ No ☐ n / a 7.5 ***Is there little or no evidence that your forage yield or quality suffers due to soil fertility problems?***

☐ Yes ☐ No ☐ n / a 7.6 ***Do you use approved cultural practices and materials to maintain or improve soil organic matter/humus content [§205.205(a) and §205.203]?*** Allowed practices and materials typically include but are not limited to the following:

- rotational grazing and other forms of good grazing management
- animal manures[34], composts, or other organic fertilizers[35]
- crop rotation (in mixed crop and livestock systems)[36]
- cover crops and green manures (in mixed crop and livestock systems)[37]
- minimizing tillage and length of time that soil remains bare
- esoteric practices (See Text Box 7A)

Text Box 7A

What Are Esoteric Practices?

Esoteric practices are metaphysical methods for crop management and animal health that are not generally accepted in the conventional scientific community, nor are they easily explained using common scientific terminology. Those esoteric practices that are often applied to soil and plant management include radionics, dowsing, the use of biodynamic preparations, and astrological planting. Most esoteric practices are allowed in organic production.[38]

7.7 ***Do you use approved cultural practices and materials to manage soil fertility and crop nutrition [§205.205(c) and §205.203]?*** Allowed practices and materials typically include but are not limited to the following:

☐ Yes ☐ No ☐ n/a

- use of deep-rooted forage species to capture nutrients from the subsoil
- use of *catch crops* in mixed crop and livestock systems[39]
- rock mineral fertilizers and amendments[40]
- use of mineral-rich organic fertilizers, manures, and/or composts[41]
- foliar fertilization[42]
- esoteric practices (see Text Box 7A)

7.8 ***Do you use approved cultural practices and materials to provide nitrogen to your forages [§205.205(c) and §205.203]?*** Allowed practices and materials typically include but are not limited to the following:

☐ Yes ☐ No ☐ n/a

- forage legumes in hay/pasture[43]
- rhizobial inoculation of legume seed
- legumes in rotation in mixed crop and livestock systems[44]
- livestock manures or composts[45]
- N-rich organic fertilizers[46]

7.9 ***Do you use approved cultural practices and materials to conserve soil and water [§205.205(d) and §205.203]?*** Allowed practices typically include but are not limited to the following:

☐ Yes ☐ No ☐ n/a

- avoiding over- and under-grazing (See Text Box 7B)
- controlling livestock access to riparian areas
- appropriate conservation structures such as buffers, grass waterways, and terraces
- contour cultivation and strip cropping in mixed crop and livestock systems
- cover crops and conservation tillage in mixed crop and livestock systems

7.10 ***Are you making best use of the available solar energy that reaches your farm or ranch (see Text Box 7B)?*** Allowed practices that optimize the capture of solar energy include but are not limited to:

☐ Yes ☐ No ☐ n/a

- interseeding/overseeding annual forages
- leaving enough forage height for rapid re-growth[47]
- selecting forage varieties best-adapted to your region
- maintaining a diversity of forages, for example, warm- and cool-season grasses, legumes, and forbs, etc.
- silvopasture

Text Box 7B

Grazing as Solar Agriculture

All agriculture ultimately runs on the energy of the sun. It may be the sunlight captured today in a growing crop through photosynthesis, or it may be the sunlight captured eons ago by primitive plants and stored as oil, coal, or natural gas—and eventually converted to nitrogen fertilizer, pesticides, and tractor fuel. Conventional agriculture is driven by reliance on the stored solar energy in fossil fuels, causing environmental problems, increasing the vulnerability of the food system, and spending the inheritance of future generations. Organic agriculture works to reverse the energy equation—reducing reliance on petroleum and focusing on the use of ambient renewable solar energy.

In contrast to systems that rely primarily on grain and mechanically harvested forages, pasture-based production is certainly much more solar-driven. Far less fuel is consumed by letting animals do their own harvesting and manure-spreading, and pasture-based production generally requires less imported fertilizer—much of which is energy intensive.

The challenge for the grazier is to optimize the capture of solar energy. This is exemplified through management strategies that support densely growing forage that wastes little-to-no sunlight on bare ground. It involves selecting forage species that keep pastures green for as long as possible throughout the year. It also involves optimizing the use of legumes to fix nitrogen and deep-rooted broadleaves to extract subsoil minerals as a means of reducing outside fertilizer needs.

Like all forms of organic farming, good organic grazing is very management intensive. In fact, what is popularly called *management intensive grazing (MIG)* or r*otational grazing* is well suited to organic systems. Fortunately, many good sources of information are available.[48]

☐ Yes ☐ No
☐ n/a

7.11 ***Do you use allowed fertilizers and soil amendments (see Text Box 7C in this section) [§205.105 and §205.203]?***

Allowed fertilizers and amendments typically include but are not limited to the following:[49]

- rock dusts; includes most mined minerals, such as aglime[50]
- animal by-products
- livestock manures
- composts
- plant materials and extracts
- marine products and by-products
- microbial inoculants and enzymes
- natural soluble fertilizers ***with restrictions***:
  - potassium chloride (muriate of potash): allowed only if it is derived from a mined source and is applied in a manner that precludes buildup of chlorides in the soil [§205.602(g)]. Note that most commercial sources of potassium chloride are synthetic and NOT allowed in organic production.
  - sodium nitrate (Chilean nitrate): allowed only if its use constitutes no more than 20% of the crop's total nitrogen requirement [§205.602(h)].

Prohibited fertilizers and amendments include but are not limited to the following:

- most synthetic or "artificial" commercial fertilizers, such as anhydrous ammonia, urea, ammonium nitrate, superphosphate, ammoniated phosphates, calcium nitrate, etc. [§205.105(a)]
- biosolids; also known as municipal waste, sewage sludge [§205.105(g)]
- most industrial by-products, especially if contaminated with heavy metals [§205.203(d)]
- ash from manure burning [§205.602(a)]

Text Box 7C

What Inputs Can I Use On Organic Pastures and Range?

One of the greater difficulties that organic producers face on a regular basis is determining whether or not a particular product or material may be used in organic production. Sad to say, the problems are real, but some basic clarifications will help. First of all, all natural or nonsynthetic materials can be assumed to be acceptable in organic production. There are a few exceptions, however, which will be explained shortly.

Most organic producers and prospective producers have heard about the *National List*. The National List comprises §§205.600-205.619 of the National Standard; §205.601 and §205.602 are those sections directly pertinent to crop production, which includes forages. §205.601 includes synthetic materials ***allowed*** in organic crop production—for example, sulfur, insecticidal soap, etc.; §205.602 addresses natural, or nonsynthetic, materials that are ***prohibited***, for example, ash from manure burning, nicotine sulfate, etc.

When considering commercial products, it is important that the grower be aware of all ingredients to determine that none are prohibited. If a full disclosure of ingredients is not found on the label, details should be obtained from the distributor or manufacturer and kept in the grower's files. Note that such details should extend to inert ingredients. When in doubt about the acceptability of any material or product for certified organic production, contact your certifier.

An important organization to know about is the Organic Materials Review Institute (OMRI).[51] OMRI is a non-profit organization that evaluates products for suitability in organic production and processing. OMRI does not have status as a regulatory body. However, its decisions with regard to the acceptability of commercial products are highly respected and accepted by most certifiers. *OMRI Listed* products can be purchased and used with a high degree of confidence. Producers should be aware, however, that there are many acceptable products in the marketplace that have not been evaluated by OMRI and do not carry the *OMRI Listed* seal. Again, it is important to contact your certifier to verify whether a particular product or material can be used.

7.12 ***Do you keep records of all fertilizer and amendment purchases, along with product labels?*** ☐ Yes ☐ No ☐ n/a

7.13 ***If you are applying manure, compost, or another acceptable fertilizer or amendment, are you taking care to avoid contamination of surface and groundwater [§205.203(c)]?***[52] ☐ Yes ☐ No ☐ n/a

☐ Yes ☐ No
☐ n/a

7.14 ***If both organic and conventional pastures and crops are fertigated using the same equipment, are you taking steps to ensure that prohibited fertilizer materials do not contaminate organic crops?*** It is a bad idea to irrigate organic crops with the same equipment used for conventional fertigation. However, any certifier that permits dual use will most likely insist on protocols that include thorough cleaning and flushing, plus a date log for all cleanouts and irrigations.

☐ Yes ☐ No
☐ n/a

7.15 ***Do you rotate feeding areas on your pastures?*** Using the same spot to feed hay or concentrated feeds results in manure accumulation in one place. This increases the hazard of nutrient pollution via run-off and leaching. It also leads to a fertility imbalance in the soil at the feeding site. Feeding hay on a permanent pad to collect manure is an alternative to site rotation.

Notes on Organic Soil Management

VIII. Weed Management in Pasture and Hay Crops

Weeds are generally considered the greatest challenge to growing organic crops, whether they be vegetables, grains, orchard trees, or pastures. The conventional farmer or rancher typically responds to weeds by spraying them with synthetic herbicides. Organic graziers do not have this option. If they are good managers, most will admit they really don't need it, either. When good grazing practices are used, along with good soil fertility management, weeds become a minor issue. Forage species gradually crowd out most weeds, and any that remain are "grazed off" along with the more desirable plants. Beyond this, specific control measures are required only on an occasional basis.

Most organic growers understand that many weeds occur simply because agricultural soil is left uncovered or unoccupied.[53] In pasture and range systems, bare soil commonly results from over-grazing. It can also result from undergrazing. Undergrazing encourages individual plants to become overly-mature, dominating space and "shading out" emerging seedling grasses, legumes, and forbs. Mature plants

are not stimulated to produce fresh growth, and nutritional quality plummets (see Text Box 15A of this workbook). When these overgrown plants are grazed or mechanically clipped, large areas of bare soil are exposed between plants—providing an excellent toehold for weeds. Grazing practices that maintain a dense stand of forage plants in their vegetative state (by not allowing them to go to seed) control many of the problem weeds that graziers are known to struggle with.[54]

One strategy that good graziers use to *manage* weeds that "escape" intensive grazing is *multispecies grazing*. For example, cattle typically do not eat woody plants; therefore goats—run alongside or in rotation with cattle—provide an excellent weed control complement. Sheep relish forbs that cattle may find unpalatable, and will clean up pastures that would otherwise require clipping.[55]

Organic producers also know that many weeds prosper under certain soil fertility conditions. Many weeds in the humid east are encouraged on low pH or low calcium soils.[56] Liming to adjust pH and provide the correct balance of calcium and magnesium can often reduce pressure from certain weeds (for more details, see Section VII of this workbook).

At the same time, fertilization can increase weed pressure. Applying large quantities of manure to the land frequently increases weeds, at least in the short term. In many such instances, the cause can be traced to weed seeds present in bedding materials. In others, however, raw manures have a stimulating effect on weed seeds already present in the soil.

There are always fallback tools available when creative management either doesn't succeed or is undone by weather or some other unexpected problem. Mowing, bushhogging, or selective hand-cutting are commonly relied upon; flame weeding or spraying with allowed herbicides may also be done. Even though a few "natural" herbicide products are now available, most are expensive, are restricted in their use, and seldom provide the same results as synthetic herbicides. Taking the big picture view of organic production, natural herbicides may be useful tools, but extensive reliance on them for weed management is inconsistent with traditional organic thinking and also contributes to producer reliance on off-farm inputs. The National Standard encourages reliance on whole system effects before employing specific practices or materials. See Text Box 8A for details on how weed control decisions must be made.

A few words should also be said about weed management in mixed crop and livestock systems. A good humus-building rotation is one of the first steps to effective weed management in pastures and hay crops, as well as in row crops. A diverse rotation also reduces the number of niches that problem weeds can exploit from year to year.[57]

Sanitation is among the most under-recognized of good organic practices. Cleaning harvesting and mowing equipment between fields can prevent the distribution of weed seeds onto previously clean areas. Mowing or flaming ditchbanks and other areas adjacent to the field can work to prevent weed infestation. However, because these areas can often serve as habitat for wildlife and beneficial insects, the timing of mowing and other operations should be carefully chosen.[58]

It is important that weeds not go to seed. Most weed species are capable of producing vast numbers of seeds that can create problems for years to come. There is growing evidence that biologically active soil—such as that encouraged under organic management—has an abundance of organisms that naturally reduce weed seed populations. However, this bonus of an organic system will not bail out bad management that allows annual reseeding of weeds.

Text Box 8A

Weed and Pest Management Decisions

§205.206—the Crop pest, weed, and disease management practice standard—requires that producers use a three-level hierarchical approach in deciding how to deal with these problems. This can most easily be explained by designating these levels A, B, and C.

Level A: The first line of defense in managing weed, insect, and disease pests generally comprises the most sustainable and systems-based practices. It emphasizes the fact that a well-designed and healthy organic system will naturally have fewer pest problems.
Level A practices specifically include:

- crop rotation and nutrient management [§205.206(a)(1)]
- sanitation measures to remove disease vectors, weed seeds, etc. [§205.206(a)(2)]
- cultural practices such as resistant or tolerant varieties, timing of planting, etc. [§205.206(a)(3)]

Level B: Level B is the second line of defense, to be chosen if the basic systemic practices of level A are not sufficient to control the weed, insect, or disease problem. Level B practices generally include mechanical and physical practices that are traditional in organics, and the use of nonsynthetic or "natural" materials.

Level B weed control options include:

- mulching with fully biodegradable materials [§205.206(c)(1)]
- mowing [§205.206(c)(2)]
- grazing [§205.206(c)(3)]
- cultivation and hand weeding [§205.206(c)(4)]
- flame, heat, or electrical weeding [§205.206(c)(5)]
- plastic mulches [§205.206(c)(6)]

Level B insect/animal pest control options include:

- introducing or augmenting predators and parasites [§205.206(b)(1)]
- developing habitat for beneficial predators and parasites [§205.206(c)(2)]
- nonsynthetic lures, traps, and repellents [§205.206(c)(3)]

Level B crop disease control options include:

- management practices (for example, fire, flooding) [§205.206(d)(1)]
- application of nonsynthetic biological, botanical, or mineral inputs [§205.206(d)(2)]

Level C: Level C is the third line of defense, to be chosen if the level of pest control required is not achieved after A and B control options are applied [§205.206(e)]. In such instances, you are allowed the wider use of biologicals and botanicals to control pests. You also have the option to use those materials included on the National List under §205.601—Synthetic substances allowed for use in organic crop production.

If you anticipate the need for level C control measures, be sure that you indicate this in your OSP. Be specific about the control materials you might be using. Outline the indicators or thresholds you monitor that will trigger the use of those materials.

8.1 ***Does your production system keep weeds at manageable levels?*** ☐ Yes ☐ No ☐ n/a

8.2 ***Do you use approved practices or materials to control weeds [§205.206]?*** ☐ Yes ☐ No ☐ n/a

Allowed practices and materials typically include but are not limited to the following:

- rotational grazing
- grazing in a timely manner
- multi-species grazing
- competitive forage types and varieties
- adjusting soil fertility, pH, etc.
- interseeding/overseeding
- higher seeding rates
- mowing/bushhogging
- allowed herbicides
- flaming[59]
- hand weeding or chopping
- machinery sanitation to prevent the spread of weed seed and rhizomes
- release of biological control agents[60]
- use of crop rotation, nurse crops, smother crops, and cultivation in mixed forage and row-crop production systems
- esoteric practices (See Text Box 7A)

Prohibited materials typically include but are not limited to the following:

x most synthetic herbicides [§205.105(a)]
x heavy metal herbicides
x soap-based herbicides—these may only be used in non-crop areas of an organic farm [§205.601(b)(1)]
x micronutrient-based herbicides [§205.601(j)(6)

Notes on Weed Management

IX. Pest and Disease Management in Pasture and Hay Crops

Pests and diseases play a vital role in natural selection by removing sick and unthrifty plants. Organic proponents argue that sickness in plants can be traced largely to poor nutrition and other stresses that result from poor crop and soil management.[61] Organic producers maintain that organic soil-building practices will produce crops that are properly nourished and thereby less susceptible to attack by pests and diseases. Furthermore, organic producers and ecologists agree that natural biological pest control arises in a healthy organic system in the form of an active complex of natural predators and parasites that suppress pest populations.

In actual practice, most managers of organic pasture and range rarely take additional action to control insect and disease pests. Where organic forages are concerned, maintaining a biodiverse ecosystem and using good fertility and cultural practices naturally keep pests and diseases from becoming a management problem. In such systems, pests are not eliminated but damage levels are low enough to be tolerated. There are exceptions, of course—grasshopper plagues in the West and armyworm invasions in humid climes are good examples of circumstances where more pest control may be required.[62]

High-value organic hay crops can also have special pest problems. Alfalfa weevil is a good example of a pest that may well require additional attention.[63] Insect and disease pest management is addressed in considerable detail in *NCAT's Organic Crops Workbook*; it contains information that is not duplicated here.[64]

The National Organic Standard requires that pest management decisions be made in a hierarchical fashion. See Text Box 8A in Section 8 for details on how pest and disease control decisions must be made in organic systems.

☐ Yes ☐ No ☐ n/a 9.1 ***Does your production system keep disease and insect pests at manageable levels?***

☐ Yes ☐ No ☐ n/a 9.2 ***Do you use approved practices to control plant disease and insect pests [§205.206]?*** Allowed practices typically include but are not limited to the following:

- Integrated Pest Management (IPM) monitoring[65]
- animal predators (birds, bats, ducks, guinea fowl, etc.)
- establishing and maintaining beneficial insect and wildlife habitats[66]
- resistant and tolerant crop varieties
- sanitation
- burning
- crop rotation
- flaming
- mass trapping of insect pests
- release of beneficial insects[67]
- application of allowed pesticides
- esoteric practices (See Text Box 7A)

9.3 ***Do you use allowed insect pest and disease control materials to manage forage pests [§205.206]?*** Allowed inputs typically include but are not limited to the following:[68] ☐ Yes ☐ No ☐ n/a

- beneficial insects and other organisms[69]
- biological pesticides[70]
- botanical pesticides[71]
- insecticidal soaps[72]
- mineral-based pesticides
- pheromones

Prohibited pest and disease control materials include but are not limited to the following:

- x most synthetic insecticides, fungicides, miticides, etc. [§205.105(a)]
- x heavy metal-based pesticides
- x synthetic wetting agents [§205.105(a)]
- x nicotine sulfate and other tobacco products [§205.602(f)]
- x strychnine [§205.602(e)]

9.4 ***Do you keep records of all pest and disease control materials used, along with the product labels?*** ☐ Yes ☐ No ☐ n/a

9.5 ***If you apply natural pesticides, do you do so in a manner that minimizes risk to non-target organisms and aquatic systems?*** ☐ Yes ☐ No ☐ n/a

Notes on Insect and Disease Pest Management

X. Seeds and Planting Stock

An entire section of the Federal Regulations—§205.204—addresses seeds and planting stock in organic production. This section is as applicable to hay and pasture crops as it is to vegetables and row crops. The first basic rule is this: organic seeds and planting stock MUST be used for organic production.[73] When an equivalent organic crop variety is not commercially available, untreated conventionally grown seeds and planting stock may be used. See Text Box 10A for an explanation of planting stock; for clarification of *equivalency* and *commercial availability*, see Text Box 10B.

The second basic rule is one that has little relevance to forage systems, but needs to be mentioned anyway. It relates to annual transplants, which MUST be organically grown for organic production.[74]

The third basic rule is: seeds, annual seedlings, and planting stock used in organic production may NOT be treated with prohibited substances. There is one exception. Treatment with prohibited substances is allowed when the application of those substances is a requirement of Federal or State phytosanitary regulations [§205.204(a)(5)].

Conventional seed treatments are usually fungicidal; most fungicides used for this purpose are prohibited in organic production. Allowed treatments include natural materials—such as biological inoculants—and synthetic substances that are on the National List—such as seaweed extracts. The most common example of allowed seed treatment is the inoculation of legume seeds with rhizobium bacteria. Since some rhizobium products can be genetically engineered or contain GE ingredients, it is important to make that determination in advance and obtain an allowed product.

Organic growers must make certain that the seeds, transplants, and planting stock they use are not genetically engineered. Purchasing these items from a certified organic producer should guarantee that the propagation materials are not genetically modified and have a minimal degree of GMO pollen contamination.

There is a particular provision in the Seeds and Planting Stock standard that may be relevant to you, especially if you establish or interplant any of your fields with perennial planting stock. Examples of perennial planting stock include grass sprigs, root pieces, and tree seedlings. §205.204(a)(4) reads "[n]onorganically produced planting stock to be used to produce a perennial crop may be sold, labeled, or represented as organically produced only after the planting stock has been maintained under a system of organic management for a period of no less than 1 year…" The popular interpretation of this section has been that perennial planting stock may be obtained from nonorganic sources, but it must be under organic management for twelve months before the first harvest of an organic crop. This interpretation is consistent with many organic certifier standards prior to federal regulation. If you read this provision carefully, however, it suggests an alternate interpretation. The alternative interpretation is that the twelve-month requirement applies to the sale of perennial planting stock, *not* to its use once it has been placed in production. In other words, it is possible that this provision is pertinent to nursery production and not to the production of fruits, nuts, produce, or forage.

The way your certifier chooses to interpret §205.204(a)(4) of the Standard can have implications if you are establishing a Bermuda grass pasture, interplanting comfrey as a forage plant, or establishing an agroforestry system—especially one with forage trees such as locust. In many of these examples, there is a lag time of one year or more to allow for establishment, which removes much of the concern. However, the question of whether you

Text 10A

About Planting Stock

The National Organic Standard lumps plant propagation materials into three basic categories: seeds, annual seedlings, and planting stock. *Seeds* is self-explanatory. *Annual transplants* are seedlings of annual crops that have been removed from their original place of production and replanted elsewhere [§205.2]. *Planting stock* is defined as "[a]ny plant or plant tissue other than annual seedlings but including rhizomes, shoots, leaf or stem cuttings, roots, or tubers, used in plant production or propagation [§205.2]." The most likely example of planting stock you might use in pasture or hay production is *sprigs*. Sprigs are clumps of stolons or rhizomes that are used to vegetatively propagate certain grasses—especially some warm-season species like Bermuda grass.

need to seek an organic source for perennial planting stock and document that search remains. Be certain to contact your certifier in advance of purchasing perennial planting stock to learn in full detail what your constraints might be.

Text Box 10B

Equivalency and Commercial Availability

Equivalent variety is generally understood to mean a cultivar of the same type and similar plant characteristics when compared to the original preferred variety. For these purposes, *type* refers to the basic plant type (for example, there is a *type* of soybean called a *haybean* that is harvested as a forage. This is different from the standard food *type* and feed *type* of soybean that most farmers are familiar with); *characteristics* refers to factors such as color, pest resistance, and maturation.

According to the National Organic Standard, an equivalent variety of seed or planting stock would be considered *commercially unavailable* if you could not locate an organic supplier. It might also be considered commercially unavailable if the organic supplier could not provide you with the quantity of seed you need, or if the available seed quality is substandard. Factors that might make seed quality substandard include the presence of seed-borne disease, very low germination percentages, high noxious weed seed content, and the like. The higher cost of organic seed and propagation materials is NOT considered an acceptable reason for using nonorganic seed or planting stock.

Ultimately, the certifier must make the final decision on whether the use of nonorganic seed or planting stock is justified. You will need to present ample documentation to support any use of nonorganic seed, including a record of your attempts to locate organic seed sources. This usually entails making a record of phone calls, letters, or e-mails to and from seed suppliers documenting attempts to find an organic source. Most certifiers want clear indication that you have contacted at least three suitable suppliers.[75]

10.1 ***Is all seed used either:***
- ***organically produced and/or***
- ***conventionally produced, non-GMO seeds that have NOT been treated with prohibited substances [§205.204(a)]?***

☐ Yes ☐ No ☐ n/a

10.2 ***Are only NON-genetically engineered seeds and planting stock used [§205.105(e)]?***

☐ Yes ☐ No ☐ n/a

10.3 ***If seeds and sprigs are produced on-farm, are they grown using organic methods and approved inputs [§205.204(a)]?***

☐ Yes ☐ No ☐ n/a

10.4 ***Where pasture is being established using perennial planting stock, such as sprigs, have you determined what your certifier requires with regard to sourcing [§205.204(a)(4)]?***

☐ Yes ☐ No ☐ n/a

☐ Yes ☐ No ☐ n/a

10.5 ***Do you retain documentation of all seeds, seed treatments (including rhizobial inoculants), and planting stock purchases?***

☐ Yes ☐ No ☐ n/a

10.6 ***Do you keep seed tags and empty packets on file?***

☐ Yes ☐ No ☐ n/a

10.7 ***If seed or plant treatments are used, have you determined that they are allowed and not genetically modified [§205.105(e)]?*** It is advisable to retain all documentation that proves a substance is allowable in organic production.

Notes on Seed and Planting Stock

XI. Field Equipment

Equipment used for pasture management and for hay production and hauling must not be a source of contamination or a means by which organic and conventional products are commingled.

☐ Yes ☐ No ☐ n/a

11.1 ***If harvesting, hauling, and crop handling equipment is also used for conventional crops, are cleanout protocols established and cleanout logs maintained?***

☐ Yes ☐ No ☐ n/a

11.2 ***If split or parallel production is done, is separate spraying equipment designated and clearly marked?***

11.3 ***If sprayers, planters, or dry material applicators are also used to apply prohibited materials for conventional production, are cleanout protocols clearly established and cleanout logs maintained?*** When seed planters are equipped with insecticide or fertilizer boxes and tanks that are NOT used for organic production, many certifiers prefer that these be removed or that the drive chains be disconnected when operating on organic acreage.

☐ Yes ☐ No ☐ n/a

11.4 ***Are your sprayers, applicators, and spreaders properly calibrated to ensure precise application of materials?***

☐ Yes ☐ No ☐ n/a

11.5 ***Are your tractors, trucks, and other equipment free of fuel, coolant, and lubricant leaks?***

☐ Yes ☐ No ☐ n/a

11.6 ***Are all internal combustion engines properly tuned and maintained to ensure optimal fuel efficiency and reduce air pollution?***

☐ Yes ☐ No ☐ n/a

11.7 ***Is routine engine cleaning and maintenance of equipment done where it cannot contaminate production fields, harvested crops, or feeds?***

☐ Yes ☐ No ☐ n/a

11.8 ***Are fuels, lubricants, paints, coolants, and the empty containers that held these fluids stored where they cannot contaminate harvested crops?***

☐ Yes ☐ No ☐ n/a

11.9 ***Do you avoid field operations when soils are wet to prevent excess compaction and damage to soil structure?***

☐ Yes ☐ No ☐ n/a

Notes on Field Equipment

XII. Hay and Haylage Harvest

Conventional hay harvesting sometimes involves the use of materials that might not be accepted in organic production. Some preservatives and mold inhibitors, for example, may be prohibited in organic production. Individual products should be checked to determine whether they are natural (nonsynthetic) or are listed as an allowed synthetic input (See §205.601 of the National Standard for the list of allowed synthetics). Use of fungicide-treated twine might be prohibited; check with your certifier.

☐ Yes ☐ No ☐ n/a 12.1 ***Are you harvesting your forages at an optimum stage to ensure high feed quality and continued viability of the stand?*** This question concerns good overall management and is not related to organic certification. Many producers sacrifice forage quality for quantity by harvesting when the crop is too mature.

☐ Yes ☐ No ☐ n/a 12.2 ***If harvest-aid products are used, are they approved for organic production [§205.105]?***

Notes on Hay and Haylage

XIII. Monitoring Your Pasture's Performance

The following questions highlight several indicators that can help you determine how well your organic management system is functioning; they can be reviewed annually and used to monitor your progress. Also included are additional questions that address special environmental concerns.

☐ Yes ☐ No ☐ n/a 13.1 ***Does your pasture consist predominantly of desirable, well-adapted legumes, forbs, and grasses?***

13.2 ***Are your forages usually at or near their optimum quality when you graze or harvest them?*** It is undesirable (and unprofitable) for pasture species to become rank and overly mature. Over-mature plants are not only low-quality livestock feed, they tend to shade out new seedlings, particularly clover, leading ultimately to bare ground between plants. (See Text Box 15A in Section XV of this workbook.)

☐ Yes ☐ No ☐ n/a

13.3 ***Are your pastures generally free of subsurface compaction?***[76] Unless the pasture is located in a natural wetland, standing water is often an indicator of subsurface compaction.

☐ Yes ☐ No ☐ n/a

13.4 ***Are your organic matter/humus levels stable or increasing [§205.203(c)]?***[77]

☐ Yes ☐ No ☐ n/a

13.5 ***If used, are tillage operations becoming easier under organic management from year to year?***

☐ Yes ☐ No ☐ n/a

13.6 ***Are earthworms and earthworm burrows evident in the soil?***[78] There are some circumstances where earthworms will not be found, even in well managed soils. Soils that routinely flood in spring, very arid soils, and some heavily glaciated soils in the northern tier of states may not have earthworms.

☐ Yes ☐ No ☐ n/a

13.7 ***Does your soil emit a rich, earthy smell when tilled or dug?***

☐ Yes ☐ No ☐ n/a

13.8 ***Is dung beetle activity evident?***[79] Dung beetle activity should be vigorous on well-managed, organic permanent pastures and range. Less activity will be seen on pastures that are part of a mixed crop rotation, because tillage disrupts the life cycle of this insect. However, dung beetles are mobile and should still be active on rotation pasture. Note: the synthetic worming agent, ivermectin—allowed in organic production on a limited and emergency basis—is especially harmful to dung beetles [§205.603(a)(12)]. Where native dung beetle populations have been wiped out, they may be replenished with commercially available species.

☐ Yes ☐ No ☐ n/a

13.9 ***Are your forages free of nutrient deficiencies under average conditions?*** Symptoms of nutrient deficiencies include chlorosis (yellowing), other discolorations of the leaves and stems, stunted growth, and consistently low yields.

☐ Yes ☐ No ☐ n/a

13.10 ***Are your livestock free of disease conditions caused by excess soil nitrogen?*** Problems that may be caused or worsened by excessive nitrogen fertilization include grass tetany,[80] prussic acid poisoning,[81] nitrate toxicity,[82] and fescue toxicity in high-endophyte fescue.[83]

☐ Yes ☐ No ☐ n/a

☐ Yes ☐ No ☐ n/a

13.11 ***Are your livestock free of disease conditions caused by deficiencies or imbalances of mineral nutrients?*** Some problems that may occur include grass tetany, which can be brought on by imbalances of magnesium and potassium as well as by excess nitrogen.

☐ Yes ☐ No ☐ n/a

13.12 ***Is there an abundance of beneficial predatory and parasitic insects (lady bugs, lacewings, mantids, small wasps, etc.) under normal conditions?***

☐ Yes ☐ No ☐ n/a

13.13 ***Is erosion controlled on all your fields, paddocks, and access lanes [§205.203(a)]?***

☐ Yes ☐ No ☐ n/a

13.14 ***Are the riparian areas (stream banks) on your farm or ranch stabilized and protected?***[84]

☐ Yes ☐ No ☐ n/a

13.15 ***Are natural wetlands on your farm or ranch protected?***

☐ Yes ☐ No ☐ n/a

13.16 ***Are waterways on your farm or ranch protected from livestock and livestock wastes [§205.239(c)]?*** It is a good idea to use fencing and water tanks to restrict stock from fouling natural streams.

Notes on Pasture Performance

XIV. The Organic Approach to Livestock Health

The basic strategy to sustain livestock vitality in organic systems is the same as in crop production—that is, to identify and optimize those elements and conditions in nature that support health. Essentially, there are three elements that must be provided: **optimum nutrition**, **low stress living conditions**, and a reasonable level of **biosecurity**. There are a number of key ways in which these three elements are expressed in organic practice—especially in mixed production and pasture-based systems. These include:

- ***Providing balanced nutrition.*** This is reflected in the National Organic Program Regulations requiring organic feed [§205.237(a)]. Just as organic proponents argue that organic food is healthier for people, they likewise maintain that organic feed is healthier for animals. In mixed crop and livestock systems, the requirement for crop rotation results in a rich diversity of feeds. Similarly, in organic pasture-based systems, the absence of synthetic nitrogen fertilizers encourages the growing of legumes alongside grasses, and the absence of synthetic herbicides allows the growth of mineral-rich forbs; these contribute to the diversity of livestock diet. Note that artificial feedstuffs like synthetic urea are explicitly prohibited in organic production because they are found to be unhealthy for the animals.
- ***Restricting exposure to toxins.*** Restricting toxin exposure is another reason for requiring organic feed. Residual pesticides and their breakdown products are additional sources of stress on livestock health—particularly to the liver, kidneys, and other systems responsible for eliminating poisons.
- ***Excluding performance enhancers.*** Synthetic hormones and antibiotics are not allowed in organic production [§205.238(c)(3) and §205.238(c)(1)]. They are viewed as food contaminants by the organic community, and there are concerns over the development of antibiotic-resistant pathogens. These inputs push livestock to unnatural performance levels and mask the effects of unhealthy production systems.
- ***Providing healthy and "natural" living conditions.*** [§205.239(a)] Living conditions are especially important to livestock health. Buildings and facilities that are overcrowded, unsanitary, lacking in fresh air movement, or are otherwise stressful to animals invite disease and injury. Living conditions for livestock must:
    - permit livestock to exercise and to exhibit natural behaviors
    - allow access to the outdoors
    - provide access to pasture for ruminants
    - offer animals protection from severe weather
    - be safe and sufficiently sanitary
    - not cause pollution
- ***Avoiding excessively stressful management practices.*** All forms of stress increase susceptibility to injury and disease. Good organic managers strive to limit stressful handling of animals as much as possible. This also applies to physical alterations—castration, ear notching, beak trimming, branding, etc. See Section XVIII of this workbook for more information on physical alterations.
- ***Preventive practices.*** Good organic livestock management also involves the use of standard preventive practices, including sanitation, vaccinations, feeding of probiotics, quarantine of sick and newly purchased animals, and other biosecurity precautions to prevent difficult pest and disease problems from infecting organic stock.

Your OSP should reflect a holistic health management plan that uses these principles and measures as a foundation. You must also indicate what practices, procedures, and materials will be used to deal with those animals that do become ill. These options are discussed in Section XIX of this workbook, "Treatment of Sick or Injured Livestock."

Finally, one aspect of organic animal health seldom discussed is the relationship between type and breed of livestock and its suitability for organic production in given climates and circumstances. The National Organic Standard addresses this concern in §205.238(a)(1). This section requires that producers choose livestock species and types suited to the site-specific conditions of the farm and those with natural resistance to prevalent diseases and parasites.

Notes on Organic Livestock Health

XV. Organic Feed

All certified organic livestock must be fed 100% organically grown feeds. Under ideal conditions most feed will be produced on-farm, which argues again for mixed (that is, integrated crop and livestock) production and pasture-based systems. Pasture-based systems have particular advantages in that animals are allowed to harvest their feed themselves under circumstances that are a close approximation of natural conditions. Pasture-based production also reduces the fossil fuel energy used and the pollution generated by harvesting, feeding, and manure spreading operations.

Text Box 15A

Quality Feed from Pasture and Hay

As good graziers know, the feed value of pasturage changes with the stage of plant growth. Grasses and forbs are most nutritious and digestible prior to flowering. Once these plants flower and begin to set seed, they become fibrous and their feed value declines precipitously. Novice graziers are too often deceived by the volume of forage that can be obtained by letting the pasture mature—the quantity may be great, but the quality is poor. Good grazing practice focuses on "harvesting" when pasture plants are young and lush. Skill, however, is required to ensure that overgrazing and/or selective grazing of the pasture does not result. Good grazing management is as much an art as it is a science.[85] Grazing management is such an important component of an organic livestock system that additional instruction through a grazing school is recommended.

The same quality vs. quantity principle should be applied to the mechanical harvesting of hay or haylage. More feed value will be obtained by cutting a lush non-matured crop.

The National Organic Program Regulations allow one exemption to the 100% feed requirement—if an entire, distinct dairy herd is under conversion to organic management, producers are permitted to feed up to 20% conventional feedstuffs for the first nine months of the transition, followed by 100% organic feed thereafter. See Section XXIII of this workbook for more details.

The National Standard does not address the quality of water provided to livestock. However, it goes without saying that adequate quantities of clean water are essential to livestock health and to good production. One particular concern is excessively high nitrates—a growing problem in groundwater sources—that can cause reproductive problems.[86]

15.1 ***Do your livestock graze only certified organic pastures or rangelands [§205.237(a)]?*** ☐ Yes ☐ No ☐ n/a

15.2 ***Are all farm-produced feeds and forages certified organically grown [§205.237(a)]?*** ☐ Yes ☐ No ☐ n/a

15.3 ***Are all purchased feeds and forages certified organic [§205.237(a)]?*** ☐ Yes ☐ No ☐ n/a

15.4 ***Are all your feed supplements and additives allowed in organic production?*** ☐ Yes ☐ No ☐ n/a

The following are specifically prohibited as livestock feed or feed supplements:

- x animal drugs and synthetic hormones [§205.237(b)(1)]
- x plastic pellets [§205.237(b)(3)]
- x urea [§205.237(b)(4)]
- x manure (including poultry litter) [§205.237(b)(4)]
- x slaughter by-products (including bone meal, blood meal, feather meal) [§205.237(b)(5)]
- x excessive amounts of feed supplements or additives [§205.237(b)(2)][87]
- x synthetic amino acids

Text Box 15 B

What Inputs Can I Use in Organic Livestock Production?

The constraints on inputs for organic livestock production are similar to those for pastures and crops (see Text Box 7C). Natural (or nonsynthetic) materials can be assumed to be allowed. Exceptions will be discussed shortly.

§205.603 of the National Standard is that portion of the *National List* that deals with synthetic substances allowed for use in organic livestock production. §205.604 deals with natural (or nonsynthetic) substances prohibited for use in organic livestock production. §205.603 is a fairly lengthy and detailed list, which has a large number of individual entries; at the time of this writing, §205.604 only lists strychnine—a botanical—as prohibited.

A few terms in the National List should be clarified. *Feed supplements*—one sub-category of allowed synthetics—refers to "[a] combination of feed nutrients added to livestock feed to improve the nutrient balance or performance of the total ration and intended to be: (1) Diluted with other feeds when fed to livestock; (2) Offered free choice with other parts of the ration if separately available; or (3) Further diluted and mixed to produce a complete feed" [§205.2]. Feed supplements are considered different from *feed additives*, which are defined as "…substance[s] added to feed in micro quantities to fulfill a specific nutritional need; i.e., essential nutrients in the form of amino acids, vitamins, and

Continued on page 40

Text Box 15B continued

and minerals" [§205.2]. At the time of this writing, the only feed supplement listed is conventional milk replacer. The accompanying annotation indicates that replacers are for emergency use only and must not contain antibiotics, non-milk products, and may not come from livestock treated with bovine somatotrophin (BST), a.k.a. bovine growth hormone (BGH) [§205.603(c)]. To our knowledge, no organic milk replacers are currently on the market and the restrictions in the annotation eliminate most conventional products. Therefore, it is obvious that the intent of this provision is to discourage use of milk replacers and to encourage the feeding of whole organic milk from the herd or flock.

Allowed feed additives, at this time, include several trace minerals and vitamins; no synthetic amino acids have yet been listed. An issue of special interest to the organic poultry community is the status of one particular feed additive, the synthetic amino acid methionine. Synthetic methionine has historical use in non-pasture based organic poultry production prior to the implementation of federal regulation. Supplemental methionine is not generally needed for the production of range- or pastured poultry in which the birds can balance their nutritional needs with insects, worms, and other wild foods that are naturally rich in this amino acid. In October 2003, the National Organic Program amended the National List, ruling that synthetic methionine may be used in organic poultry only until October 21, 2005 [§205.603(d)(1)]. This sunset provision was recommended by the National Organic Standards Board to allow producers time to find alternative natural sources before the complete ban on synthetic methionine goes into effect.

Organic livestock producers can expect a considerable degree of confusion with regard to allowed synthetics—much more, in fact, than they will see with organic crop production. It is critical that you work closely and establish good lines of communication with your certifier. This begins with the development of a clear and detailed OSP, in which you outline all of the inputs you might use in all anticipated circumstances.

It is also helpful for you to know about the Organic Materials Review Institute (OMRI).[88] See Text Box 7C for a description of OMRI.

☐ Yes ☐ No ☐ n/a 15.5 ***Do you retain all feed tags and feed purchase records?***

☐ Yes ☐ No ☐ n/a 15.6 ***Do you retain all purchase records and labels from feed supplements and additives?***

☐ Yes ☐ No ☐ n/a 15.7 ***Do you have a backup plan in case of an on-farm feed shortage emergency, and is it outlined in your Organic System Plan?*** It is a good idea to include the names of feed brokers you would contact should the need arise.

☐ Yes ☐ No ☐ n/a 15.8 ***Do your livestock have free access to fresh, clean water?***

XVI. Livestock Living Conditions, Facilities, and Handling

According to the Regulations, organic livestock producers must establish and maintain living conditions that accommodate the health and natural behavior of their animals. The requirements reflect concerns for animal welfare and sustainability of production as well as for environmental quality. The means used to meet these requirements appear to be flexible at this time and accommodate a wide range of production philosophies.

While adjustments may be made to accommodate stage of production, climatic conditions, and the environment, the Regulations [§205.239(a)(1)] require that all livestock have access to:

- outdoor areas
- shade
- shelter
- space for exercise
- fresh air
- direct sunlight

Shelter must be designed to allow animals

- opportunity to exercise [§205.239(a)(4)(i)]
- protection from temperature extremes [§205.239(a)(4)(ii)]
- adequate ventilation [§205.239(a)(4)(ii)]
- comfort behaviors [§205.239(a)(4)(i)]
- natural grooming and maintenance [§205.239(a)(4)(i)]
- a low-hazard environment to prevent injury [§205.239(a)(4)(iii)]
- bedding as appropriate to the species; must be organic if typically consumed [§205.239(a)(3)]

Full confinement of livestock is permitted on a temporary basis only. The circumstances that permit temporary confinement of organic livestock are:

- inclement weather [§205.239(b)(1)]
- specific health and safety needs of the animal [§205.239(b)(3)]
- risk to soil or water quality [§205.239(b)(4)]
- the animal's stage of production [§205.239(b)(2)] (see Text Box 16A)

NOP requirements for living conditions highlight a number of conflicts with practices in use before federal organic standards were in place. A good example is the use of hoop houses for swine production. This alternative production system, which originated in Sweden, is noted for being exceptionally humane. It does an exceptional job of allowing natural behavior while providing good sanitation and protection from severe weather. The drawback of this system—from an organic perspective—is that current designs do not allow for outdoor access.[89]

There is also a clash with some conventional biosecurity concerns. The most notable conflict involves outdoor

Text Box 16A

Temporary Confinement for Stage of Production

An example of stage of production confinement would be the final finishing of beef cattle. The National Organic Standards Board recommends a finish stage of no more than 120 days of confinement. It is interesting to note, however, that research has shown that beef cattle can be fattened in a confinement-free pasture environment if high-energy grain is provided to them—cattle typically prefer grain to forages. Producers might also consider that there is a growing market for grass-finished beef, which uses no supplemental grains. Producing high-quality grass-finished beef requires excellent grazing management, however. Be sure to do your homework in advance.

access for poultry. Conventional wisdom argues that outdoor access can increase the vulnerability of poultry flocks to disease. Avian influenza (AI)—for example—is considered one of the more serious threats to poultry production. AI is spread by wild fowl; however, outbreaks to date have been largely limited to confinement operations. This suggests that some factor in outdoor production—sunlight, perhaps—may act as a biocontrol. Still, arguments are made for confined production based on the threat posed by AI.

Talk to your certifier about any plans you have to restrict outdoor access of your livestock. Be certain to outline your rationale in detail in your OSP.

Ruminant livestock must have access to pasture or range. Organic pasture should be managed to produce the quantity and quality of forage and browse suitable to the grazing species, stage of production, and stocking rate. See Text Boxes 3A and 15A for more information on pasture.

Poor quality livestock housing and living conditions can become a health hazard for the animals, the farmer, and the farm help. These concerns are most common in conventional confinement production systems and should be less of a hazard in organic production. However, hazards can still occur. Specific things to watch out for include:

- ammonia accumulation in temporary confinement buildings
- dust and other airborne particulates
- histoplasmosis and other avian-associated respiratory diseases
- hantavirus and other diseases spread by rodents
- safety of facilities and equipment to prevent accidents

While the Regulations do not provide guidelines for artificial lighting, access to natural light and dark cycles can reasonably be interpreted as essential to the welfare of livestock. This may have particular relevance to the practice of forced molting. In conventional operations egg producers often attempt to synchronize and increase production by limiting laying hen access to food, water, and natural periods of darkness. Technically, forced molting can be seen as a violation of §205.238(a)(4), which requires the *reduction* of stress; §205.238(a)(2), which requires the provision of adequate feed; and §205.239(a), which requires living conditions that accommodate natural behavior. Therefore, it is not likely that many certifiers will allow the practice of forced molting.

Another possible issue for organic egg producers is the fate of "spent hens"—layers that have ceased to be productive. If the birds are slaughtered for organic food, they should be treated in the same manner as broilers or other slaughter stock. However, if the birds are destroyed to create fertilizer, conventional feed, or simply for disposal, questions of humane handling and of site contamination may be raised by the certifier. Such practices should be discussed with the certifier in advance and outlined clearly in the OSP.

In instances where conventional operations are being converted to organic production, treated wood may be permitted if it does not present a significant contamination hazard to animals or feed. However, new or replacement construction may not contain any prohibited materials, such as arsenate-treated wood, lead-based paints, creosote, etc., where they can contact organic crops or animals.[90]

Unnecessary stress reduces productivity, increases susceptibility to disease, reduces meat quality, increases the likelihood of injury to both animals and humans, and, therefore, should be minimized. The National Organic Standard is not prescriptive as regards livestock handling practices, and there is little guidance provided in the traditional organic literature. Fortunately, increased interest in humane and low-stress handling procedures ensures that such information is becoming more readily available.[91]

16.1 ***Are all your livestock given access to the out-of-doors, fresh air, sunlight, space to exercise, and shelter from inclement weather [§205.239(a)(1)]?*** ☐ Yes ☐ No ☐ n/a

16.2 ***Are all your livestock provided with sufficient quantity and quality of feed and water to meet their health and welfare needs [§205.238(a)(2)]?*** ☐ Yes ☐ No ☐ n/a

16.3 ***Are all your ruminant stock provided with pasture [§205.239(a)(2)]?*** ☐ Yes ☐ No ☐ n/a

16.4 ***Do you feed hay or other feeds to ruminants when pasture or range forage is not available [§205.238(a)(2)]?*** Allowing animals to starve in order to save on costs or to preserve organic status is not allowed. ☐ Yes ☐ No ☐ n/a

16.5 ***Do your animals on pasture or range have access to some form of protection from severe weather [§205.239(a)(1)]?*** ☐ Yes ☐ No ☐ n/a

16.6 ***Are all wooden livestock buildings, corrals, handling facilities, fence posts, gateposts, board fencing, etc., constructed either with untreated wood or with other allowed materials [§205.206(f)]?*** If prohibited materials are present in older buildings, they must not present a contamination hazard. Prohibited materials may be used in circumstances where they cannot contaminate organic agricultural soil or livestock. ☐ Yes ☐ No ☐ n/a

16.7 ***Do you use allowed materials and processes[92] to control structural pests in livestock production buildings [§205.271(c) and §205.271(d)]?*** See Text Box 16B. ☐ Yes ☐ No ☐ n/a

Text Box 16B

Structural Pest Management Decisions

Structural pests include a wide range of organisms that can damage structures, such as termites; use structures as habitat and a food source, like mice and grain weevils; or exploit the structural environment to infect or infest another host animal, as mites and lice do. Like pasture weed, pest, and disease management, you are required to use a multi-level hierarchical approach in deciding how to deal with structural pests. In this case, there are four levels, which will be referred to as A, B, C, and D.

Level A: The first line of defense generally comprises preventive measures.
These Level A practices specifically include:

- removal of pest habitat, food sources, and breeding areas [§205.271(a)(1)]
- prevention of pest access [§205.271(a)(2)]
- management of environmental factors [§205.271(a)(3)]

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Text Box 16B continued

Level B: Level B is the second line of defense, to be chosen if the preventive practices of Level A are not sufficient to control pests. Level B practices generally include mechanical and physical practices. Level B practices include:

- traps, light, sound, and similar physical controls [§205.271(b)(1)]
- natural and allowed synthetic lures and repellents [§205.271(b)(2)]

Level C: Level C is the third line of defense, to be chosen if the level of pest control required is not achieved after A and B control options are applied [§205.271(c)]. In such instances, you are allowed the wider use of nonsynthetic and allowed synthetics provided for on the National List.

Level D: In the event that pest control actions A, B, and C do not adequately prevent or control facility pests, a synthetic substance *not* on the National List may be applied ***PROVIDED THAT*** the producer and the certifier agree on the substance, method of application, and measures to be taken to prevent contact with organic livestock, feed, or other organic products [§205.271(d)]. If Level D action is taken, you must update your OSP to reflect the application, how it was made, and the contamination control measures used [§205.271(e)].

If use of a prohibited pesticide is required by federal, state, or local laws or regulations, this does not compromise your organic status as long as measures are taken to prevent contamination of the livestock, livestock feed, and other organic products [§205.271(f)].

☐ Yes ☐ No ☐ n/a 16.8 ***Do you provide adequate bedding for temporary- and semi-confined livestock when and where needed [§205.239(a)(3)]?*** Note: in circumstances where livestock typically consume a portion of the bedding, the bedding materials must be certified organic.

☐ Yes ☐ No ☐ n/a 16.9 ***Do you store prohibited materials where they pose no danger of contamination to livestock?***

☐ Yes ☐ No ☐ n/a 16.10 ***Is housing cleaned and manure removed often enough to protect livestock health [§205.238(a)(3)]?***

☐ Yes ☐ No ☐ n/a 16.11 ***Do you use allowed materials to clean and sanitize housing units [§205.271(c) and §205.271(d)]?***

☐ Yes ☐ No ☐ n/a 16.12 ***Is your feeding equipment adequately maintained and cleaned to prevent injury to livestock and to prevent the spread of disease?***

☐ Yes ☐ No ☐ n/a 16.13 ***Are your watering systems adequately maintained and sanitized for the purpose of preventing disease or the spread of disease?***

16.14 ***Do you use allowed materials and processes to clean watering and feeding systems [§205.271(c) and §205.271(d)]?*** ☐ Yes ☐ No ☐ n/a

16.15 ***If livestock must be transported long distances, are they provided with feed and water en route?*** ☐ Yes ☐ No ☐ n/a

16.16 ***When moving, working, or otherwise handling your livestock, do you use methods that minimize stress to the animals?*** ☐ Yes ☐ No ☐ n/a

16.17 ***Do you have a strategy for disposal of dead livestock that does not pose a health risk to other livestock, contaminate organic products, or pollute the environment [§205.238(a)(3)]?***[93] Organic producers need to understand and follow state regulations regarding dead animal disposal. Composting is a desirable option in areas where it is permitted. ☐ Yes ☐ No ☐ n/a

16.18 ***Are your production buildings and areas adequately protected from pesticide drift and/or infiltration by contaminated runoff water?*** ☐ Yes ☐ No ☐ n/a

16.19 ***Are plastics and other wastes from the operation properly disposed of to prevent contamination or livestock health problems?*** See Text Box 16C. ☐ Yes ☐ No ☐ n/a

Text Box 16C

Recycling and Waste Management

Though it strives to be more environmentally friendly, organic farming, like conventional farming, will still generate waste materials that cannot be recycled on-farm. Common examples include plastic bale wrappers and natural pesticide containers. Recycling is the preferred option for plastic, aluminum, and glass wastes; landfilling should be used if recycling is not an option.

Burning of plastics is strongly discouraged. If you must burn plastics, be certain that you do not burn them with wood or other materials that you plan to return to the field. Ash that has been contaminated with plastics is prohibited in organic crop production [§205.203(d)(4)].

16.20 ***Is all water runoff from production areas controlled or contained so that it does not contaminate surface waters or cause soil erosion [§205.239(c)]?*** ☐ Yes ☐ No ☐ n/a

16.21 ***If you produce organic and conventional animals, do you segregate the animals or use some form of identification to ensure that commingling does not occur?*** ☐ Yes ☐ No ☐ n/a

☐ Yes ☐ No
☐ n/a

16.22 ***Do you use organically approved methods and materials to manage weeds around facilities and buildings?*** Allowed practices and materials typically include but are not limited to the following:

- thermal weeding (for example, flaming)
- hoeing or hand-pulling
- mowing/string trimming
- herbicidal soaps [§205.601(b)(1)]

☐ Yes ☐ No
☐ n/a

16.23 ***Are your buildings and production lots numbered and records maintained that document management history?***

Notes on Livestock Facilities

XVII. Manure Management

Manure is one of the most valued fertilizers on an organic operation. Capturing the full value of manure requires attention to how it is collected, stored, and spread on the field. This workbook section will focus on matters that relate to collection and storage. *NCAT's Organic Crops Workbook* and other ATTRA publications address its use as a fertilizer and soil amendment.[94]

National Organic Program Regulations state that organic producers "must manage manure in a manner that does not contribute to the contamination of crops, soil, or water by plant nutrients, heavy metals, or pathogenic organisms and optimizes recycling of nutrients" [§205.239(c)]. This has implications not only for how manure is applied to the field, but also for how it is handled and stored prior to spreading. Contamination is not the only issue. Unless properly handled, manure can also be a health issue for livestock and humans. Accumulating manure can breed flies, generate high levels of ammonia gas, and spread disease.

The Regulations do not specify handling procedures, only that the system used not compromise organic integrity. Therefore, in theory and in fact, you have a number of alternatives for how you may manage manure.

Composting is one of the most reliable and time-honored means of conserving and recycling manure nutrients and is highly recommended for organic farming. It stabilizes the nutrients in manure, protecting them against volatilization and leaching. At the same time, it aids in the control of plant and animal diseases, flies, and weeds.[95]

Should you choose to compost your manure, there are a few constraints you should know about if you intend to sell compost to other organic producers or plan to use it yourself in the production of food crops. §205.203(c)(1) of the Regulations places strict limitations on how and when raw uncomposted manure can be applied. Uncomposted manure may not be used on food crops less than 120 days prior to harvest if the edible portion has contact with the soil; it may not be used less than 90 days before harvest on food crops where the edible portion does not have soil contact. Composted manure does not have these restrictions; however, the National Standard is very specific in its definition of compost.

For compost to meet National Organic Program specifications, the initial carbon:nitrogen ratio of the beginning compost feedstocks must be between 25:1 and 40:1. A temperature between 131º F and 170º F must be maintained for 3 days when using an in-vessel or static aerated pile system. The temperature must be maintained between 131º F and 170º F for 15 days when using a windrow composting system; during that 15 days, the materials must be turned a minimum of five times [§205.203(c)(2)].

Further restrictions on compost-making also apply. These relate to the addition of other feedstock materials. Allowed materials include bedding, food wastes, ground rock powders, Biodynamic™ preparations, and those materials otherwise allowed as organic fertilizers or soil amendments. Materials that may NOT be added to the compost pile if it is to be used in organic production include most synthetic fertilizers [§205.105(a)], biosolids (sewage sludge) [§205.105(g)], pesticide-contaminated materials [§205.203(c)], materials contaminated with heavy metals [§205.203(c)], and plastics [§205.203(e)(1)].

No matter what system of manure management you elect to use, be certain that you do not use any prohibited materials in the process. Two specific examples can be cited. If you are using a barn lime or other rock powder to absorb and deodorize animal wastes, be aware that hydrated lime is specifically prohibited in §205.603(b)(3); superphosphate is also prohibited [§205.105(a)]. In conventional lagoon systems, stabilizing chemicals are frequently added. Be certain you are using an allowed stabilizer for organic management. Consult your certifier when in doubt.

Controlling manure flies is another issue. The great majority of synthetic insecticides and synthetic insecticidal baits are prohibited in organic production. Good sanitation procedures, composting, and some common sense management can go a long way in reducing the manure fly problem. These fundamental steps can be backed up with biological and allowed insecticidal controls. Refer to Text Box 16B for guidance in how to make decisions for controlling these pests.

17.1 ***If manure is stockpiled or lagoon-stored, do you take measures to avoid leaching and contamination of surface waters[§205.239(c)]?*** ☐ Yes ☐ No ☐ n / a

17.2 ***If a lagoon system is used to store manure, is the capacity of your system sufficient to eliminate the hazards of dike failure or overflow during heavy rains[§205.239(c)]?*** ☐ Yes ☐ No ☐ n / a

17.3 ***Is your production facility, including all lots and pens, managed to prevent contamination of ground and surface waters by manure leaching and runoff [§205.239(c)]?*** ☐ Yes ☐ No ☐ n / a

☐ Yes ☐ No ☐ n/a

17.4 ***Do you use organically acceptable means to control manure-breeding flies [§205.105(a)]?*** Allowed options include but are not limited to:

- sanitation
- manure composting
- odor management
- parasitic wasps, hister beetles, beneficial nematodes, or other introduced biological controls[96]
- flying insect traps[97]
- diatomaceous earth
- botanical pesticides

☐ Yes ☐ No ☐ n/a

17.5 ***Do you use organically acceptable means for odor management [§205.105(a)]?*** Allowed options include but are not limited to:

- manure composting
- microbial inoculants (source must be GMO-free)
- botanical extracts
- manure drying
- rock powders

☐ Yes ☐ No ☐ n/a

17.6 ***If you produce and stockpile compost, do you take precautions to ensure that surface and groundwater contamination does not occur[§205.239(c)]?***

☐ Yes ☐ No ☐ n/a

17.7 ***Do you keep your compost free from contamination by prohibited substances?***

☐ Yes ☐ No ☐ n/a

17.8 ***If you use your compost for food crop production or sell it to other organic producers, do you keep compost production records that include daily temperature readings and frequency of windrow turnings?***[98]

Notes on Manure Management

XVIII. Physical Alterations

Physical alterations refer to irreversible procedures that alter the natural appearance or function of animals. They are typically used for five reasons in livestock management:

1) for purposes of identification, for example branding, tattooing, ear tags, ear notching
2) to prevent injury from fighting or cannibalism among animals, for example debeaking, dehorning, tail clipping, castration
3) to prevent damage to pastures, for example nose rings in hogs
4) to improve product quality and marketability, for example castration, caponization; and
5) for livestock health, for example tail docking in sheep.

According to the National Organic Standard, physical alterations are permitted "as needed to promote the animal's welfare." Convenience for the producer should not be construed as "animal welfare." For example, the docking of tails on dairy cattle may serve the convenience of the dairyman by removing the irritation occasioned by being slapped in the face by a wet tail. However, a cow's tail has definite purpose in fighting off flies and its removal is not likely to be in the animal's best interests.

A further requirement of the Organic Standard is that physical alterations be done "in a manner that minimizes pain and stress" [§205.238(a)(5)]. For example, it is desirable to castrate male calves at a very young age, as opposed to later in life when the pain and stress is much greater. Another example is the use of freeze branding using dry ice, which is considered more humane than fire branding using electrically- or fire-heated metal.[99]

Since the Regulations are not specific about which practices are and are not acceptable, there is no consistent agreement among certifying bodies (or even among animal welfare advocates) as to what alterations should be allowed. If you are planning to use any physical alterations on your livestock, clearly outline in your OSP WHAT you plan to do, HOW you plan to do it, and WHEN it will be done. Be especially clear in explaining WHY you plan to do the alteration. These alterations should be justified in the plan with regard to their necessity for livestock welfare, product quality, and audit control. It is also wise to indicate whether the planned alterations will be a routine practice or a contingency in the event of extreme animal behavior. You are strongly advised to confer closely with your certifier to determine what is and is not an acceptable practice for your operation.

18.1 ***Have you discussed all planned and contingency physical alterations with your certifier and outlined them in your OSP?*** ☐ Yes ☐ No ☐ n/a

18.2 ***Are you selecting physical alteration methods and performing them in a manner that causes the least amount of pain and stress to your animals [§205.238(a)(5)]?*** ☐ Yes ☐ No ☐ n/a

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Notes on Physical Alterations

XIX. Treatment of Sick or Injured Livestock

Despite the best efforts of organic management, some livestock will inevitably get sick or injured and require treatment. At the time of this writing, many routine veterinary medicines—most notably antibiotics—are prohibited. Animals treated with prohibited medications cannot be sold as organic. This sometimes leaves the producer in a quandary—should an animal be treated at the cost of its organic status, or should one gamble on hopes of recovery without treatment, even if the animal suffers? In fact, the National Organic Regulation does not allow you that choice—§205.238(c)(7) states that the producer of organic livestock must not "[w]ithhold medical treatment from a sick animal in an effort to preserve its organic status. All appropriate medications must be used to restore an animal to health when methods acceptable to organic production fail…"

Because few conventional medications are allowed, organic producers have been encouraged to explore complementary and alternative veterinary medicine (CAVM)[100] treatment options, such as herbalism, homeopathy, radionics, acupuncture, chiropractic, and other non-traditional modalities. CAVM treatments can certainly be viewed as "appropriate medications" as long as they provide needed relief and care for the animal. Keep in mind that no treatment, conventional or alternative, will always be successful.

On a practical level, one of the wisest things you can do is to find a veterinarian who understands and supports your choice to be organic. With such a vet as your "herd health partner," it is much easier to develop treatment strategies that are holistic and NOP compliant, and that avoid the accidental use of prohibited medicines when suitable alternatives are available.[101] Of course, this is easier said than done. Currently, the number of practicing veterinarians that both understand the NOP Regulations and are trained in alternative modalities are still few and far between. When working with conventionally minded veterinarians, you must take extra precautions. Many vets will give antibiotic injections without asking or even explaining what they are doing. You will need to clarify your situation at the outset. You may need to provide the alternative medication and even administer it yourself. Keep in mind that many alternative therapies work slowly and are more effective with chronic conditions than acute ones. Finally, if the alternative treatments you try should fail, you will need to resort to conventional treatments and accept the loss of organic status for that animal.

It is expected that many new-to-organic producers will attempt to adapt conventional confinement production systems to organic. This raises a specific concern: that some producers might design production systems to "sacrifice" a high percentage of livestock to disease, thus circumventing the intent of the Regulations, which is that the production system itself be healthy. For example, a producer might plan on raising too many animals in semi-confinement with the idea that he or she will treat any visibly sick animals with antibiotics, and sell the untreated "survivors" as organic. Such Plans are not considered acceptable. Producers are warned against developing OSPs that anticipate high culling percentages and subsequent conventional sales as a health management strategy.

☐ Yes ☐ No
☐ n/a

19.1 ***Are you using organically acceptable strategies and techniques to treat, control, and/or prevent diseases and injuries in livestock [§205.105]?***
Allowed options include but are not limited to:

- selective breeding
- quarantine of newly purchased, injured, or diseased animals
- nutritional therapy
- aseptic protocols during vaccinations, physical alterations, and surgical procedures

- use of electrolytes, glucose, dextrose
- vitamin therapy
- probiotics (includes colostrum—must not be from a genetically engineered source)
- iodine
- hydrogen peroxide
- vaccination[102]
- herbal remedies[103]
- homeopathy[104]
- flower essences, and related therapies
- acupuncture[105]
- chiropractic
- aromatherapy
- radionics[106]
- reiki[107]

Prohibited materials and techniques include but are not limited to:

x antibiotics [§205.238(c)(1)]
x genetically modified probiotics [§205.105(e)]
x most conventional veterinary medications

19.2 ***Do you keep records of all animal health products used, along with their purchase receipts and labels?***[108] ☐ Yes ☐ No ☐ n/a

19.3 ***Do your herd/flock health records accurately document all health treatments given and/or procedures performed?***[109] ☐ Yes ☐ No ☐ n/a

19.4 ***Are your herd/flock health records adequate to track animals treated with prohibited materials to ensure that they are NOT sold as organic [§205.236(c)]?*** ☐ Yes ☐ No ☐ n/a

19.5 ***If livestock become sick or injured, do you take action and apply the necessary medications to restore health regardless of the consequences to the animal's organic status [§205.238(c)(7)]?*** ☐ Yes ☐ No ☐ n/a

19.6 ***Are you using allowed medications solely for the purposes of restoring animal health [§205.238(c)(2)]?*** This is not a trick question—you may not administer any animal drug to enhance growth or performance. Medications are allowed only for the treatment of injury or disease. ☐ Yes ☐ No ☐ n/a

19.7 ***Do you have a working relationship with a veterinarian?*** ☐ Yes ☐ No ☐ n/a

Notes on Sick or Injured Livestock

XX. Internal and External Parasite Management

The first line of defense in parasite management—especially of internal parasites—is optimal nutrition. Livestock provided with ample quantities of good quality organic feed for their stage of growth have an excellent chance of staying a step ahead of parasites.

The second line of defense is biodiversity. The diversity of a well-managed organic farm or ranch goes a long way towards reducing pressure from internal and external parasites. Biodiverse landscapes support biological control. Furthermore, the variation in cultural practices, controlled grazing, and the like reduce the niches these pest organisms require to thrive. Still, many organic producers consider parasites one of their greatest challenges, and additional management and inputs are often required to keep these pests under control.

Producers are encouraged to investigate cultural practices before purchasing costly off-farm inputs. This is especially true of alternative pesticides, which can be quite expensive. There is also the matter of safety. Simply because a pesticide is natural does not mean it is safe. Botanicals, in particular, can be toxic to humans, livestock, and a wide range of non-target organisms. Be certain to follow label instructions should you need to use them.

Text Box 20A

Grazing and Parasite Management

There are a number of strategies and techniques that graziers can use to reduce problems with internal and external parasites. Most of them require a good degree of management skill and a controlled grazing environment. For example:

- by controlling how low pasture forages are grazed, one can reduce the intake of internal parasites, since they tend to reside on the lower portions of plant stems and leaves

Continued on page 53

Text Box 20A continued

- by rotating pastures on a timely basis, internal parasites are allowed to hatch and die before the host livestock return to the field—a self-cleaning process
- since most internal parasites are not shared across species, both multi-species grazing or rotational grazing with different species are viable strategies for reducing parasite loads
- allowing younger, more parasite-susceptible stock to graze first on fresh pasture; older, less susceptible stock can follow when forage is shorter and the parasite hazard increases
- following cattle with pastured or ranged chickens is a strategy for reducing both internal and external parasites—particularly flies. Poultry "disassemble" manure pats, destroying eggs and feeding on larvae.

20.1 ***Are you using organically acceptable strategies and techniques for preventing and controlling internal parasites in livestock [§205.105]?*** [110] ☐ Yes ☐ No ☐ n/a

Among the preventatives and treatments for internal parasites are a number of modalities that might be considered unconventional and experimental. They are, however, allowed for use in organic production systems. Options include but are not limited to:

- pasture rotation (see Text Box 20A in this section of the workbook)
- controlled grazing (see Text Box 20A in this section of the workbook)
- multi-species grazing (see Text Box 20A in this section of the workbook)
- dragging or clipping pasture to disperse manure piles
- fecal sampling as a monitoring tool
- selective breeding for resistant stock
- sanitation
- herbal treatments (see Text Box 20B in this section of the workbook)
- diatomaceous earth (see Text Box 20B in this section of the workbook)
- ivermectin (see Text Box 20B in this section of the workbook)
- electrotherapies[111]
- radionics[112]

Prohibited materials and techniques include but are not limited to:

- x most synthetic worming agents [§205.105(a)]
- x ionophores—antibiotics that control protozoan parasites [§205.238(c)(1)]

Text Box 20B

About Organically Acceptable Dewormers

If you farm or ranch in a region with high internal parasite pressure, then you have a particularly difficult challenge. As you will see, there are very few organically acceptable products available to assist you.

Diatomaceous earth (or DE) is often touted as a parasiticide and is commonly used by organic producers. DE is manufactured from the fossilized remains of tiny sea organisms called diatoms,

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Text Box 20B continued

which are mined and ground to make a fine "shell flour." The particles of the flour have sharp edges that pierce the exoskeleton of parasites and insect pests, causing damage that leads to their deaths. The sharp edges are apparently small enough that they cause no damage to the intestinal tracts of livestock. When used, DE is often mixed with feeds, with free-choice supplements, or is provided as free choice on its own. The only direct physical hazard comes from breathing too much DE; silicosis and related lung conditions can result. An indirect—and possibly more serious hazard—may result from failure to control a significant parasite problem.

While heavily promoted as a dewormer, the efficacy of DE is open to question. Some veterinarians believe that the positive effects attributed to DE actually arise from other aspects of good organic management and diatomaceous earth is accorded more credit than it deserves. However, the jury is still out on this matter and DE should not be entirely discounted as a deworming agent. If you choose to use DE, make certain that it is part of a more comprehensive parasite management plan. Also, be certain that you are using an organically acceptable form of diatomaceous earth. There are formulations of diatomaceous earth intended for use in swimming pool filters and similar applications. These forms are not allowed.

Several herbal agents[113] are also reputed to be useful for deworming livestock. Garlic is most often mentioned, though other plants and plant extracts have also been used. It has even been suggested that raw garlic be added to the feed. If you choose such a strategy, be certain to consult with your certifier. The garlic or other plants used in this manner may need to be organically grown. Unless "home-grown," herbal dewormers are likely to be expensive and their efficacy is not well documented as yet.

At the time of this writing, one synthetic parasiticide—ivermectin—is allowed for limited use in organic production. Ivermectin is prohibited in slaughter stock, but is allowed for emergency treatment of dairy and breeder stock when management strategies do not prevent infestation. Milk or milk products from a treated animal cannot be marketed as organic for 90 days following treatment. In breeder stock, treatment cannot occur during the last third of gestation if the progeny will be sold as organic and must not be used during the lactation period of breeding stock [§205.603(a)(12)].

One of the principal concerns surrounding the use of synthetic dewormers is their effect on the ecology of soil life—especially those organisms involved in the breakdown and incorporation of manure. Ivermectin is known to decimate dung beetles, one of the main organisms involved in manure recycling. It is wise, therefore, to make limited use of this material.[114]

The National Organic Standards Board has brought up the possibility of removing ivermectin from the National List at some time in the near future. It may or may not be replaced with another synthetic option.

20.2 ***Are you using organically acceptable strategies and techniques to control or prevent flies, mosquitoes, and external parasites [§205.105]?*** Options include but are not limited to: ☐ Yes ☐ No ☐ n/a

- pasture rotation
- multi-species grazing (see Text Box 20A in this section of the workbook)
- dragging or clipping pasture to disperse manure piles
- manure management (see Section XVII of this workbook)
- sanitation[115]
- ventilation and moisture control
- screening
- fly parasites and other beneficials[116]
- bat conservation[117]
- purple martins[118]
- walk-through fly traps[119]
- sticky traps
- flying insect traps[120]
- electric bug zappers
- biological pesticides
- diatomaceous earth
- botanical pesticides and preparations

Prohibited materials and techniques include but are not limited to:

- x most synthetic insecticides and acaricides[121] [§205.105(a)]
- x synthetic insecticidal ear tags [§205.105(a)]

Notes on Parasites

XXI. Assessing the Vitality and Health of Your Organic Livestock

The following questions can assist you in assessing the effectiveness of your organic production system with regard to livestock health.[122] It is highly advisable to also utilize the services of your veterinarian. Arrange for routine herd health checks to be done and give serious consideration to your veterinarian's advice and observations. See Section XIX of this workbook for more background.

☐ Yes ☐ No ☐ n / a 21.1 ***Do your livestock appear well fed (that is, in good body condition for age of animal, no ribs showing, etc.)?***

☐ Yes ☐ No ☐ n / a 21.2 ***Is there a low incidence of ascites and other metabolic diseases[123] in your poultry flock?***

☐ Yes ☐ No ☐ n / a 21.3 ***Do your animals have healthy coats?***

☐ Yes ☐ No ☐ n / a 21.4 ***Are your animals' eyes bright and clear?***

☐ Yes ☐ No ☐ n / a 21.5 ***Are your animals active and responsive?***

☐ Yes ☐ No ☐ n / a 21.6 ***Are the teats and udders of lactating animals in good condition?***

☐ Yes ☐ No ☐ n / a 21.7 ***Are your animals' feet/hooves in good condition?***

☐ Yes ☐ No ☐ n / a 21.8 ***Is there little evidence of sores, swelling, or inflamed tissues on your livestock?***

☐ Yes ☐ No ☐ n / a 21.9 ***Are there few incidents of injury and illness?***

☐ Yes ☐ No ☐ n / a 21.10 ***Is there little evidence of fighting and aggression?***

☐ Yes ☐ No ☐ n / a 21.11 ***Are your animals typically calm and content?***

☐ Yes ☐ No ☐ n / a 21.12 ***Are veterinary visits primarily for preventive care?***

Assessment Notes

XXII. Predator Management

Wild and domestic predators can be a problem in almost any livestock system, causing costly injuries and death losses. However, looks can sometimes be deceiving. Producers should first determine whether the animal carcass being devoured was actually killed by the suspected predator or whether it died from another cause, making the "suspect" nothing worse than a scavenger. Such assessment can prevent unnecessary expense and reduce negative impacts on wildlife diversity and neighbor relations.

22.1 ***Are you using organically acceptable strategies and techniques to control predation of your livestock[124] [§205.105]?*** Options include but are not limited to: ☐ Yes ☐ No ☐ n/a

- night confinement of stock
- lambing in secure sheds and lots
- guard animals[125]
- noise, light, and visual devices
- fencing
- live trapping and relocation
- proper disposal of dead animals (see Text Box 22A in this section of the workbook)

Prohibited materials and techniques include but are not limited to:

x poison baits—§205.604(a) specifically prohibits strychnine

Text Box 22A

Disposing of Dead Livestock

Dead livestock and unmanaged livestock processing wastes can be a source of disease and can attract scavengers and predators that can become a danger to live animals. Furthermore, the potential exists for highly valued scavengers, such as bald eagles, to become infected with the diseases of domestic stock; it may also disrupt their natural feeding behaviors.

Composting is a desirable means of disposal. Most Cooperative Extension offices have information on composting dead livestock.[126]

Notes on Predator Control

XXIII. Source of Animals

Compared with most organic standards across the globe, the USDA's National Organic Standard is more strict with regard to the source of livestock. The history of each animal is a major determining factor in whether it can eventually be sold or represented as organic. Some animals obtained from nonorganic sources can be transitioned into organic production under certain conditions and if specific criteria are met [§205.236].

Please refer to Figure 2 "Origin of Livestock." It is a flowchart published by the National Organic Program on April 11, 2003 to help producers understand the requirements of the Regulation. Further detail and elaboration follow:

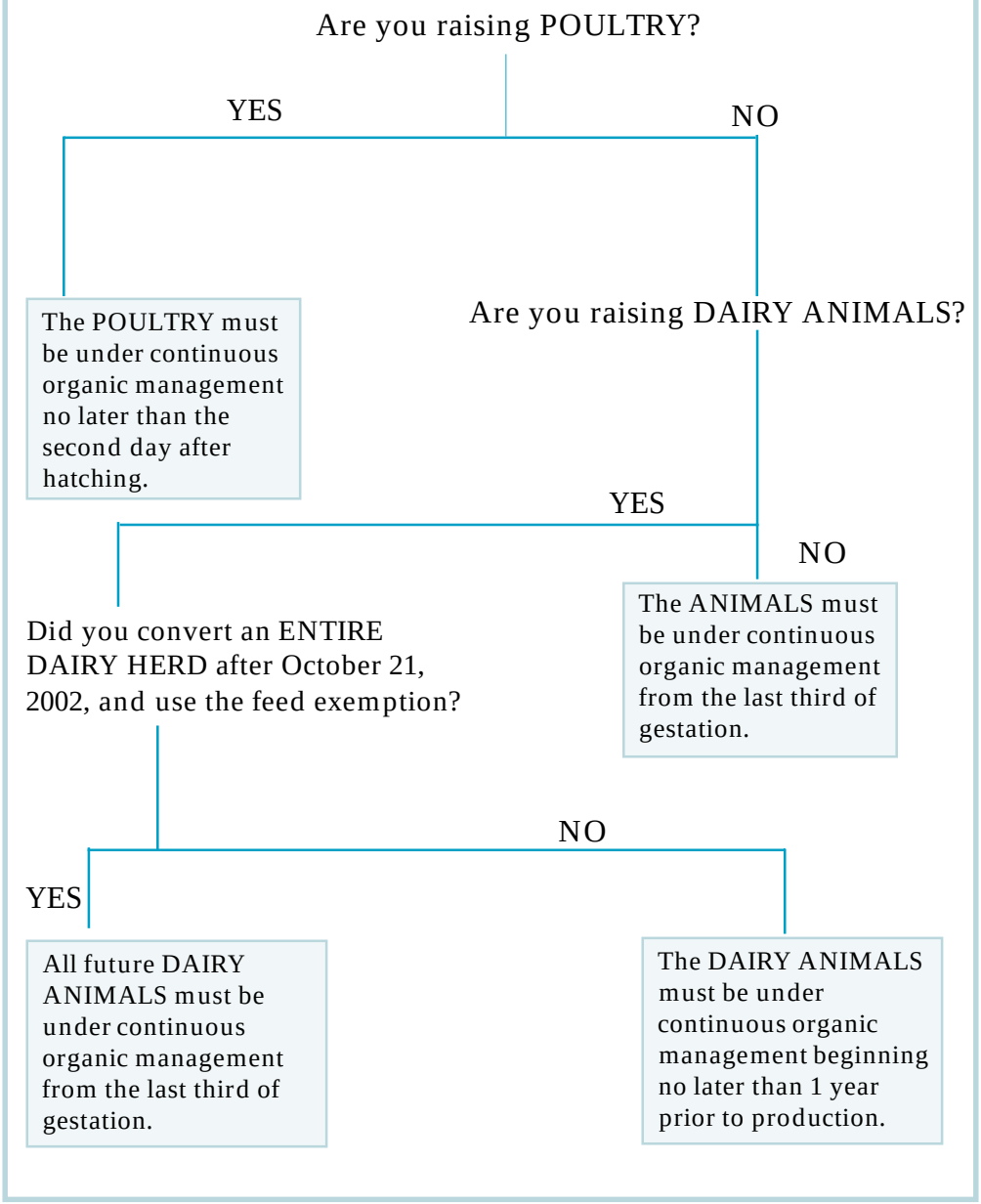
- Mammalian livestock (cattle, sheep, hogs, goats, rabbits, etc.) raised for meat production must be under full organic management beginning no later than the third trimester of gestation. For example, bred cows from conventional sources must be under full organic management at least three months prior to calving for the offspring to be considered organic.
- Livestock used as breeder stock may be obtained from a nonorganic operation. However, while they may be used to produce organic offspring, the breeder animals themselves may not be sold as organic slaughter stock.
- Poultry chicks from conventional sources are allowed for the production of organic meat and eggs only if raised organically beginning the second day of life, that is, as "day-old chicks." Older birds grown under conventional management are only allowed as breeder stock for production of hatching eggs.
- Dairy animals from conventional sources must be maintained under organic management for a minimum of one year prior to selling, representing, or using their milk or milk products as organic.
- If an entire, distinct dairy herd is under conversion to organic management, you are allowed to feed up to 20% conventional feedstuffs for the first nine months of the transition, followed by 100% organic feed thereafter. Dairy offspring whose dams receive less than 100% organic feedstuffs during the final trimester of pregnancy may not be marketed as organic meat animals. Note that there are several ways to interpret the 80/20 Rule. Contact your certifier!
- Once a dairy herd has been fully transitioned into organic status under the 80/20 Rule, ***all*** of the herd's milk-producing animals must be under organic management from the third trimester of gestation.

FIGURE 2

ORIGIN OF LIVESTOCK

April 11, 2003

Section 205.236 of the National Organic Program requires that livestock products that are to be sold, labeled, or represented as organic must be from livestock under continuous organic management as represented below.



There is considerable confusion on how to interpret the National Standard regarding replacement dairy animals. As stated in §205.236(2), one year of organic management is all that is required for dairy animals before their milk may be marketed as organic. This suggests that conventional heifers may be acquired and "transitioned" as needed for replacement or herd expansion. However, §205.236(2)(iii) states that once an entire herd has been converted, all dairy animals must be organic from the last third of gestation—the same as the requirement for slaughter stock—implying that you cannot acquire further conventional heifers and convert them to organic production. The two sections are clearly contradictory.

A resolution for the "replacement heifer" conundrum will likely require a change in the regulations, though this could take considerable time to come about. The NOSB is currently recommending a conservative interpretation. The language they recommend as a change in the Regulation states: "On existing organic dairy farms all replacement or expansion dairy animals shall be under continuous organic management from the last third of gestation." If the conservative interpretation is enforced, it has significant implications for the raising of dairy replacements.

No matter what interpretation is chosen, the National Standard varies considerably from what some producers were accustomed to prior to Federal Regulation. To retain organic status, dairy calves may ***not*** receive antibiotics or any other prohibited medicines at any time. They may not be fed conventional milk replacers, except in emergencies (see Text Box 15B for details). Organic producers also may not sell or "farm out" their organic heifer calves, ewe lambs, or doe kids to a conventional operation with the intent of re-acquiring and re-integrating those animals into the organic dairy herd at a future date.

In light of all the uncertainties surrounding replacement dairy animals, it is most important that you clarify your strategy in your OSP and consult with your certifier in advance.

Finally, it should be mentioned that artificial insemination (a.i.) ***is*** permitted in organic production. Antibiotics used to preserve a.i. semen are allowed at the recommendation of the NOSB. However, the use of hormones to synchronize estrous cycles for breeding is ***not*** allowed.

☐ Yes ☐ No ☐ n / a 23.1 ***If livestock have been acquired from an organic source, do you have verification of their organic status [§205.236(c)]?***

☐ Yes ☐ No ☐ n / a 23.2 ***Do you retain purchase records for all acquired livestock?***

☐ Yes ☐ No ☐ n / a 23.3 ***Do you keep adequate feed and management records to document the transition of conventional dairy animals to organic status [§205.236(c)]?***

☐ Yes ☐ No ☐ n / a 23.4 ***Do you keep adequate records to document the organic management of breeder stock to ensure the organic status of their offspring [§205.236(c)]?***

☐ Yes ☐ No ☐ n / a 23.5 ***If you are raising organic livestock (other than poultry) for slaughter or for production of other non-dairy livestock products, have the animals been under continuous organic management from the last third of gestation [§205.236(a)]?***

23.6 ***If you are raising organic poultry, have the birds been under continuous organic management beginning no later than the second day of life [§205.236(a)(1)]?*** ☐ Yes ☐ No ☐ n/a

23.7 ***If you are producing organic milk or milk products, is the milk coming from animals that have been under continuous organic management for no less than 12 months [§205.236(a)(2)]?*** ☐ Yes ☐ No ☐ n/a

23.8 ***If you chose to convert your entire dairy herd to organic production at one time, have you provided a minimum of 80% organic feed for the first 9 months of the 12-month conversion period [§205.236(a)(2)(i)]?*** ☐ Yes ☐ No ☐ n/a

23.9 ***If you chose to convert your entire dairy herd to organic production at one time, have you provided a minimum 100% organic feed for the last 3 months of the 12-month conversion period and continued to provide 100% organic feed thereafter [§205.236(a)(2)(ii)]?*** ☐ Yes ☐ No ☐ n/a

Notes on Source of Animals

XXIV. Feed Storage

There are several areas of concern regarding feed storage. The first involves preserving feed quality. In large part this necessitates sound design and construction of bins, cribs, barns, and other storage structures, followed by good maintenance. Feed quality also involves controlling pests. All pest control must be done using organically acceptable methods and materials. See Text Box 16B for more information on facility pest management.

A second concern of feed storage is contamination. Care must be taken that feed not become contaminated by prohibited materials like fuels, lubricants, and cleaning agents. Wood treated with prohibited chemicals must not be used where it can contact stored feeds. A contamination hazard can also be presented by baling twine that has been treated with a fungicide to prevent rotting. Be certain to check with your certifier—they may not even allow you to use treated twine. Treated twine—and plastic twine for that matter—must be properly disposed of. Used twine should not be left where animals can chew it or

get tangled in it; it should not find its way onto manure or compost piles, and it definitely should not be left or spread in the field. Dumping in a proper landfill appears to be the soundest means of disposal. For more information, see Text Box 16C.

The third area of concern is the hazard of commingling organic with conventional feeds. This is primarily an issue for split operations.

☐ Yes ☐ No ☐ n/a 24.1 ***Are the floors, ceilings, and walls of your feed storage bins in good condition?***

☐ Yes ☐ No ☐ n/a 24.2 ***Are the floors, ceilings, and walls of your feed storage bins constructed of non-treated lumber or other materials that will not contaminate organic crops?***

☐ Yes ☐ No ☐ n/a 24.3 ***Are your feed storage bins sealed to prevent access by rodents, birds, and other pest animals?***

☐ Yes ☐ No ☐ n/a 24.4 ***Where both conventional and organic feeds are handled and stored, are organic and conventional storage bins segregated and clearly marked?***

☐ Yes ☐ No ☐ n/a 24.5 ***Where feed bins and storage areas have mixed use (both conventional and organic storage), are there clean-out protocols, clean-out logs, storage records, and visible labeling that clearly establish whether the contents are organic or conventional?***

☐ Yes ☐ No ☐ n/a 24.6 ***Are prohibited materials stored away from organic storage units?***

☐ Yes ☐ No ☐ n/a 24.7 ***Are appropriate sanitation procedures used?***

☐ Yes ☐ No ☐ n/a 24.8 ***Are you using organically acceptable pest control products and practices?***[127] See Text Box 16B for information on how pest control decisions should be made. Approved pest control techniques and materials include but are not limited to:

- fencing/screening/netting
- good sanitation
- noisemakers
- trapping
- release of beneficial predators/parasites
- barn cats
- diatomaceous earth
- approved biological pesticides
- approved botanical pesticides
- vitamin D3 (for rodents)

24.9 ***Are stored feeds reasonably free of pest problems?*** ☐ Yes ☐ No ☐ n/a

24.10 ***Do storage facilities meet farm/ranch needs for capacity and the ability to segregate feeds as needed?*** ☐ Yes ☐ No ☐ n/a

24.11 ***If some feeds are stored off-farm, are these storage units either certified organic or included in your farm's inspection and certification?*** ☐ Yes ☐ No ☐ n/a

24.12 ***If you are using plastic bale wrappers, plastic silage bags, plastic baling twine, or are allowed to use treated baling twine, are the wastes properly disposed of to ensure organic integrity and to protect the environment?*** ☐ Yes ☐ No ☐ n/a
See Text Box 16C for additional information.

Notes on Feed Storage

XXV. On-Farm and Custom Feed Processing or *Handling*

The National Organic Program Regulations make use of the term *handling* to denote processing and related activities. §205.2 specifically defines a *handler* as "[a]ny person engaged in the business of handling agricultural products, including producers who handle crops or livestock of their own production…" It defines a *handling operation* as "[a]ny operation or portion of an operation…that receives or otherwise acquires agricultural products and processes, packages, or stores such products." Therefore, when the Regulations refer to *handlers*, they are referring to a varied group of individuals and businesses that include both specialized organic food processors *and* farmers who do value-added processing. It should be noted that retailers (such as grocers) that do not process or re-package the organic goods they sell need *not* be certified.

Feed processing/handling scenarios can range from very simple to very complex, depending on the nature of the operation. In the simplest of cases, producers purchase commercial organic feeds from certified suppliers. In such instances there are very few concerns about contamination or commingling.

In more complex circumstances, farmers may have their feeds processed by custom processors who, likely as not, also process conventional feeds. This greatly increases the dangers of contamination and commingling. Having your own processing equipment reduces the hazard enormously, but not necessarily if you run a split operation.

There is less hazard of commingling when custom milling is done on your farm than when feedstuffs are hauled to a mill. On-farm custom processing typically involves only one or two units of processing machinery, and it is easy to ensure proper clean-out before an organic batch is run. In contrast, stationary commercial feed mills typically have a large number of bins, augers, transfer legs, and other equipment; only a certified organic mill would be certain to employ all the protocols necessary to ensure organic integrity.

There are several ways to ensure organic integrity in feed handling. Many of these are covered in the workbook questions provided in this section.

Commingling and contamination issues aside, a word should be said about ration formulation. Ration formulations for conventional livestock production will, in most instances, also be suitable for organic production—as long as only 100% organic feeds and allowed ingredients are used, of course. Contact Cooperative Extension for guidance in developing healthy stock rations[128].

While conventional ration formulas are generally suitable, organic management and crop rotation design may dictate some adjustments. Hybrid corn grown under organic management may have a somewhat lower protein content than the same varieties produced with conventional fertilization; the amino acid balance, however, is often more favorable. Conversely, organic producers sometimes choose to grow open-pollinated corn varieties, some of which have significantly higher protein and mineral contents. Diverse crop rotations also result in a greater variety of unconventional feedstuffs that can be challenging to incorporate into rations.

☐ Yes ☐ No ☐ n/a 25.1 ***Is your on-farm milling, mixing, and/or chopping equipment properly maintained to prevent contamination of organic feeds with prohibited materials?***

☐ Yes ☐ No ☐ n/a 25.2 ***If conventional feeds are also processed on your farm, are equipment clean-out protocols clearly established and logs maintained?***

☐ Yes ☐ No ☐ n/a 25.3 ***When custom processing is done on your farm using portable equipment provided by a service or neighboring farmer, is that processing service or farmer certified organic?***

☐ Yes ☐ No ☐ n/a 25.4 ***If you are using a noncertified portable custom processing unit, are thorough clean-out protocols established and a clean-out log maintained?*** Be certain the name and address of the custom service is recorded and available to the inspector/certifier and that arrangements can be made for inspection of the equipment and processing records.

☐ Yes ☐ No ☐ n/a 25.5 ***When processing equipment is* purged *(sacrificing the first batch of organic feed following conventional processing), do you keep adequate records on the quantity of feed used in purging and how it was subsequently used?*** The first batch of feed used to purge processing equipment may be dis-

posed of in a number of ways. It may be sold on the conventional market, fed to conventional livestock in split or parallel production, fed to draft animals, or used as a soil amendment, etc.

25.6 ***If you use an off-farm custom feed handler, is he or she certified organic?*** The National Organic Program Regulations prohibit handling of organic feed at mill sites that have not been certified [§205.237(a)]. ☐ Yes ☐ No ☐ n/a

Notes on Feed Processing

XXVI. On-Farm and Custom Livestock Processing or *Handling*

It is not enough merely to raise animals organically. In order for livestock products to bear the organic label, all processing and handling of the products must be done by certified operators. This includes (but is not limited to) all slaughtering, packing, and milk processing.

The typical handling operations this section is concerned with are butchering, cheese making, the cleaning and packaging of eggs, etc. Because of their innate complexity, most of these handling/processing components will likely require the submission of an organic *handling* system plan[129] in addition to the OSP that you prepare as a *production* plan. Be prepared to pay additional inspection and certification fees in this instance.

One of the major concerns in organic processing, regardless of scale, is identifying and sourcing approved ingredients. All allowed nonorganic ingredients (with the exception of water and salt, which are considered natural and allowed) are addressed in the National List. §205.605 of the National List deals with ***non-agricultural*** substances that are allowed in organic processing, both natural (nonsynthetics) and synthetics. §205.606 deals with nonorganically produced ***agricultural*** products that are allowed.

As with organic production, OMRI has an valuable role to play in the evaluation of products for organic processing. *OMRI Listed* products can be purchased and used with a high degree of confidence. As a reminder, however, there are many acceptable products in the marketplace that have not been evaluated by OMRI and do not carry the *OMRI Listed* seal. When in doubt, contact your certifier to verify whether a particular product or material can be used.

Another question surrounds processing technologies. At present, only ionizing radiation and genetic engineering are specifically prohibited [§205.105(e) and §205.105(f)].

Water quality is a particular concern in organic processing. Microbial contamination is the primary issue. Hydrogen peroxide, ozone, and chlorine are among the synthetic materials allowed in organic processing that are effective in controlling microbial contamination. The use of chlorine requires additional clarification.

§205.605(b)(9)—the portion of the National List that outlines non-agricultural synthetics allowed in organic processing—says that chlorine materials are allowed for "disinfecting and sanitizing food contact surfaces," and that "residual chlorine levels in the water shall not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act." (Currently the residual chlorine limit under the Safe Drinking Water Act is 4 parts per million, or ppm.) The language of this section has caused a great deal of misunderstanding and has led to a wide disparity of interpretation among certifiers. Some have assumed that this language means that chlorinated water greater than 4 ppm chlorine may not come in contact with organic food products and may be used only for sanitizing food preparation surfaces. Others have assumed that the language requires that food products be washed only with water that contains no more than 4 ppm chlorine—a level that is virtually ineffectual for sanitizing. Still other certifiers have believed that the Safe Drinking Water Act criterion allows highly chlorinated water to be used, but that the wastewater leaving the organic facility be less than 4 ppm chlorine.

The most rational interpretation (that we have heard, at least) is that the notation in the regulation was improperly written; that the intent of the provision was that the rinse water that makes final contact with the organic product contain less than 4 ppm chlorine. In other words, a food product such as whole chickens may be bathed in water containing a high concentration of chlorine for sanitation purposes. However, that product must receive a thorough final rinse of water that contains less than 4 ppm chlorine.

The producer should be aware that full clarification of the regulation regarding chlorine has not been made at the time of this writing. Therefore, be certain to consult with your certifier if you are using chlorine products for organic processing.

Further issues in on-farm processing include avoiding contamination and commingling and the management of waste products, among others. Unfortunately, the scope of this workbook is limited with regard to processing and we are not covering those details in any depth. If you are planning a complex processing operation, you are encouraged to consult someone in the industry with first-hand experience as well as your certifier.

☐ Yes ☐ No ☐ n/a

26.1 ***Are all the technologies you use for on-farm processing or in custom processing allowed in organic production [§205.270(a)]?*** Allowed technologies include but are not limited to:

- baking
- boiling
- canning
- chilling
- churning
- cooking
- curing
- cutting
- dehydrating
- distilling
- drying
- eviscerating
- extracting
- fermenting
- freezing
- grinding
- heating
- jarring
- mixing
- packaging
- preserving
- separating
- slaughtering
- smoking
- washing

26.2 ***Are you avoiding the use of ionizing radiation or ingredients that have been treated with ionizing radiation [§205.105(f)]?*** ☐ Yes ☐ No ☐ n/a

26.3 ***Has a flow chart of all on-farm processing steps and procedures been developed and is it available for review by the certifying body and its inspectors?*** ☐ Yes ☐ No ☐ n/a

26.4 ***Are all purchased raw commodities and ingredients used in on-farm processing or in hired custom processing certified organic or otherwise allowed for use in organic processing [§205.105 and §205.270]?*** ☐ Yes ☐ No ☐ n/a

26.5 ***Do you take care to determine that all ingredients are NOT genetically engineered and do not result from a process that uses genetically modified organisms [§205.105(e)]?*** ☐ Yes ☐ No ☐ n/a

26.6 ***Do you keep labels, invoices, and descriptions of all ingredients, processing aids, and cleaning agents on file?*** ☐ Yes ☐ No ☐ n/a

26.7 ***Do you use proper sanitation protocols in on-farm processing?*** ☐ Yes ☐ No ☐ n/a

26.8 ***Do you use food-grade equipment and inputs in processing?*** ☐ Yes ☐ No ☐ n/a

26.9 ***Where both organic and conventional products are handled and processed, do you have protocols for segregation of product and clean-up clearly established and are they adequate to prevent contamination and commingling [§205.272(a)]?*** ☐ Yes ☐ No ☐ n/a

26.10 ***Where both organic and conventional products are handled and processed, are your logs of processing runs and clean-outs up-to-date?*** ☐ Yes ☐ No ☐ n/a

26.11 ***Do you store prohibited substances away from processing equipment, processing inputs, raw products, and finished products?*** ☐ Yes ☐ No ☐ n/a

26.12 ***Do you maintain processing equipment to prevent contamination of organic products with lubricants or other contaminants?*** ☐ Yes ☐ No ☐ n/a

26.13 ***If you do on-farm meat processing, do you have a strategy for disposal of offal and other waste products that does not pose a health risk to livestock, contaminate organic products, or pollute the environment?*** ☐ Yes ☐ No ☐ n/a

☐ Yes ☐ No ☐ n/a 26.14 ***Is wastewater from processing managed in a way that does not cause pollution or a health hazard?***

☐ Yes ☐ No ☐ n/a 26.15 ***Are packaging wastes managed so they do not contaminate organic products and do not create a pollution problem?*** See Text Box 16C for more information on waste management.

☐ Yes ☐ No ☐ n/a 26.16 ***Are coliform tests completed for all water used in food processing and washing?*** Annual testing is advisable and may be required by the certifier.

☐ Yes ☐ No ☐ n/a 26.17 ***If you are using chlorine for sanitation purposes in on-farm processing, do you have a clear understanding of your certifier's expectations with regard to meeting the National Standard for residual chlorine levels [§205.605(b)(9)]?*** See the text in this section for clarification.

☐ Yes ☐ No ☐ n/a 26.18 ***Have you performed any and all additional water analyses as requested by your certifier?***

☐ Yes ☐ No ☐ n/a 26.19 ***If water treatment technologies are needed or required, have they been installed and are they fully functional?***

☐ Yes ☐ No ☐ n/a 26.20 ***Are you satisfied that your water sources are free of contamination by prohibited substances?***

☐ Yes ☐ No ☐ n/a 26.21 ***If you are producing both organic and nonorganic eggs, are protocols in place to prevent the commingling of products [§205.272(a)]?***

☐ Yes ☐ No ☐ n/a 26.22 ***If you are producing both organic and conventional meats, are protocols in place to ensure that commingling of meat products does not occur [§205.272(a)]?***

☐ Yes ☐ No ☐ n/a 26.23 ***If you are producing both organic and nonorganic milk and/or milk products, are protocols in place to prevent commingling [§205.272(a)]?***

☐ Yes ☐ No ☐ n/a 26.24 ***If you are producing both organic and conventional animal fiber and/or fiber products, are protocols in place to prevent commingling [§205.272(a)]?***

☐ Yes ☐ No ☐ n/a 26.25 ***If commercial trucking is used to haul animal products from your operation, is care taken to ensure that organic products are not contaminated or commingled with conventional products [§205.272(a)]?***

26.26 ***If you process meat and meat products on your farm, has your processing facility also been inspected and has it met organic requirements?*** ☐ Yes ☐ No ☐ n/a

26.27 ***If you have livestock processed elsewhere for sale under your own label, is your meat processor certified organic or has the facility been covered under your organic inspection and certification?*** ☐ Yes ☐ No ☐ n/a

26.28 ***If you process and package milk and milk products, has your processing facility also been inspected and has it met organic requirements?*** ☐ Yes ☐ No ☐ n/a

26.29 ***If you have milk and/or milk products processed elsewhere for sale under your own label, is your processor certified organic or has the facility been covered under your organic inspection and certification?*** ☐ Yes ☐ No ☐ n/a

26.30 ***If you package eggs, has your packaging facility also been inspected and has it met organic requirements?*** ☐ Yes ☐ No ☐ n/a

26.31 ***If you have eggs packaged elsewhere for sale under your own label, is your packager certified organic or has the facility been covered under your organic inspection and certification?*** ☐ Yes ☐ No ☐ n/a

26.32 ***If you process fiber, has your facility also been inspected and has it met organic requirements?*** ☐ Yes ☐ No ☐ n/a

26.33 ***If you have fiber processed elsewhere for sale under your own label, is your processor certified organic or has the facility been covered under your organic inspection and certification?*** ☐ Yes ☐ No ☐ n/a

Notes on Processing / Handling

XXVII. Packaging and Labeling

Producers that package and label their products have several things to consider besides the challenge of designing eye-catching, customer-friendly logos. The packaging used for organic products must not contaminate the contents or otherwise compromise organic integrity. Packaging materials must not be impregnated with prohibited pesticides and should not be stored in a manner that invites pest infestation.

The Regulations have very strict requirements for labeling. There are four categories of labeling based on product composition:

- "100% Organic" is any product that contains 100% organic ingredients (excluding salt and water, which are considered natural). Most raw, unprocessed products off-the-farm can be designated "100% Organic". Likewise, many value-added farm products that have no added ingredients—such as frozen whole chickens, fresh ground beef, and packaged eggs—can also be labeled "100% Organic."
- "Organic" can be used to label any product that contains a minimum of 95% organic ingredients (excluding salt and water). Up to 5% of the ingredients may be nonorganic agricultural products that are not commercially available as organic and/or non-agricultural products that are in §205.605 of the National List.
- "Made With Organic _____" can be used on the label of a product that contains at least 70% organically produced ingredients (excluding salt and water). There are a number of detailed constraints regarding the ingredients that comprise the nonorganic portion. Producers should consult §205.304 of the Regulations for details.
- The specific organic ingredients may be listed in the ingredient statement of products containing less than 70% organic contents—for example, "Ingredients: water, barley, beans, organic tomatoes, salt." See §205.305 of the Regulations for more details.

The USDA's official organic seal may only be used on products that can be labeled "100% Organic" or "Organic." Products labeled "100% Organic" or "Organic" may also feature the logo of the certifying agent on the label. Small producers exempted from certification (that is, marketing less than $5000 of organic product) may not use the USDA seal, may not sell their products for use in certified products, and may not state in any manner that their product is certified.

The labeling of organic products is rather detailed where processed products are involved. This is especially true when a number of different ingredients—some of them nonorganic—are used. This workbook will not venture further into these complexities. For guidance on labeling, refer to Subpart D of the National Standard: §205.301 for labeling based on percent organic product composition; §205.302 regarding calculations for percentage of ingredients; §205.303-§205.305 for additional details on package labeling. §205.306 addresses the labeling of livestock feeds; §205.307 addresses the labeling of non-retail containers; §205.308-§205.309 deals with point of retail labeling; §205.311 addresses the specifics on use of the USDA seal.

USDA Organic Seal

For most organic farmers who market raw and unprocessed products, labeling issues are not complex. In most instances where these producers are required to supply a label, the words "100% Organic" or "Organic" will be appropriate. Even in such circumstances, it is important to read and understand the specifics of labeling in the Organic Regulations and to confer with your certifier. Be certain, too, to describe in full detail and include a copy of your label in your OSP.

27.1 ***Are all packaging materials free of impregnated pesticides or other prohibited substances [§205.272(b)(1)]?*** ☐ Yes ☐ No ☐ n/a

27.2 ***Are all packaging materials stored where they will remain free from contamination or infestation by pests?*** ☐ Yes ☐ No ☐ n/a

27.3 ***If you are re-using any bags or containers, are you taking measures to ensure that there is no risk of commingling with nonorganic products or of contamination with prohibited substances [§205.272(b)(2)]?*** ☐ Yes ☐ No ☐ n/a

27.4 ***Is all labeling in compliance with the National Organic Program Regulations [§205.300, §205.301, §205.302, §205.303, §205.304, §205.305, and §205.306]?*** Be sure to read the appropriate sections of the Regulations and confer with your certifier. ☐ Yes ☐ No ☐ n/a

27.5 ***Where sales of both organic and conventional products occur, do adequate labeling and protocols exist to ensure segregation?*** ☐ Yes ☐ No ☐ n/a

27.6 ***Are all product lots sold from your farm assigned lot numbers that permit traceability through your record keeping system [§205.236(c)]?*** Generally this would not be considered necessary for products such as freezer beef that are marketed directly to the end consumer. Further information on lot numbers is provided in Section XXIX. ☐ Yes ☐ No ☐ n/a

Notes on Packaging and Labeling

XXVIII. Marketing

Organic certification and regulation have arisen largely in response to a growing organic marketplace[130] in which the producer and the end consumer never meet face-to-face. This marketplace is similar in many ways to the conventional marketplace, though the players are different and the infrastructure is not as well developed (as a rule).

Traditionally, organic agriculture has been associated with relationship-based direct marketing and local/regional food systems. Relationship-based marketing covers those strategies in which customers and farmers actually ***do*** meet and may even get to know each other. Direct marketing strategies are NOT required in the National Standard. However, there is good reason to consider direct marketing if you grow fresh vegetables and flowers, produce range eggs or freezer beef, [131] and are located near a city or other market opportunity. Local and regional marketing shortens the distance food products travel, improves quality for the consumer, and typically leaves more of the food dollar in the producer's pocket. The following are several local and regional marketing options:

- Community Supported Agriculture[132]
- direct sales to local stores, processors, and restaurants[133]
- farmers' markets[134]
- roadside sales[135]
- agri-entertainment[136]

Notes on Marketing

XXIX. Documentation, Record Keeping, and Audit Trail

Whether you are an organic or a conventional farmer, the amount of recordkeeping required is increasing. In the conventional realm, much of the increase relates to regulation of fertilizer nutrients and pesticides. In organic systems, the recordkeeping is necessary to ensure organic integrity.

§205.103 of the National Standard is specific with regard to requirements for record keeping on an organic operation. The records must:

1) be well-adapted to the business being conducted,
2) disclose all activities and transactions in adequate detail,
3) be maintained for not less than five years beyond their creation,
4) be sufficient to demonstrate compliance with federal regulations, and
5) be available for inspection by the certifier and by authorized representatives of the State organic program and the Secretary of Agriculture.

The actual amount of documentation the individual producer will need to generate and file to meet these requirements is not exact and depends on the complexity of the operation.

The *audit trail* refers to the documentation necessary to determine the source, movement, and transfer of ownership of any organic product. A complete and thorough audit trail allows a processed product—a carton of yogurt, for example—to be traced back to the farm the milk originally came from. Sometimes the concept of audit trail is also extended to include production records and inputs, which also serve to demonstrate that the producer is farming organically.

Lot numbers are an important aspect of a good audit trail. Lot numbers are codes assigned by producers to link products to their origin and the year or date on which they were produced. Lot numbers may not be necessary if you direct market, but are essential if you sell into wholesale markets or to processors. A good lot numbering system is logical and can readily be decoded. For example, Lot No. OE061434 might code for Organic Eggs, from production building #06, which was collected on the Julian Calendar date 143 (May 23), in the year 2004. Lot No. OC0604 might code for Organic Corn, from bin #06, which was harvested in 2004.[137]

Identification of individual animals or groups of animals is important in organic management and is often linked to or incorporated into the lot number system. Livestock identification becomes especially important in split operations and in circumstances where select animals within the herd are nonorganic either because they are breeding stock or because of treatment with prohibited medications.

The following are among the common forms of documentation that organic livestock producers must keep to ensure a complete audit trail and record system[138]:

- accurate maps with fields, paddocks, pen numbers, feed storage areas, and/or production units clearly marked with a consistent numbering or lettering system
- accurate history sheets for fields, paddocks, pen numbers, and/or production units. History includes record of production practices, materials applied, dates of field operations, etc.
- copies of correspondence and notices to neighbors, county road maintenance authorities, utilities, and others that demonstrate efforts to ensure the protection of organic fields from spraying and other forms of contamination
- soil and water test reports
- verification of the organic status of seeds, sprigs, and other purchases that require such documentation
- seed tags and/or seed packaging
- documentation of efforts to procure organic inputs where needed
- forage crop pest and disease monitoring reports
- labels from purchased fertilizers, pest control products, and other inputs
- production logs and activity records
- crop harvest records
- verification of organic status for purchased animals
- herd/flock health records
- labels from vaccines and any other medications
- labels from cleansers and sanitizers
- breeding records
- labels from purchased feeds, supplements, and additives
- receipts from purchased feeds
- receipts for purchased inputs and/or services
- clean truck affidavits

- outgoing bills of lading
- weight records
- storage records
- equipment and storage unit cleanout logs
- slaughter and processing records
- sales receipts and / or invoices
- sales records
- complaint log[139]

☐ Yes ☐ No ☐ n / a 29.1 ***Is there an adequate animal identification system in place [§205.236(c)]?***

☐ Yes ☐ No ☐ n / a 29.2 ***Does your lot numbering and audit control system permit accurate tracking of animals and animal products through processing and marketing [§205.236(c)]?***

☐ Yes ☐ No ☐ n / a 29.3 ***Are records of sales maintained to ensure a complete audit trail?***

☐ Yes ☐ No ☐ n / a 29.4 ***Are you maintaining a complete set of operation records covering the production and handling of all agricultural products that you intend to be sold, labeled, or represented as organic [§205.103(a)]?***

☐ Yes ☐ No ☐ n / a 29.5 ***Is your record keeping system appropriate and well adapted to the needs of your organic operation [§205.103(b)(1)]?***

☐ Yes ☐ No ☐ n / a 29.6 ***Does your record keeping system fully disclose all activities and transactions in sufficient detail so as to be readily understood and audited [§205.103(b)(2)]?***

☐ Yes ☐ No ☐ n / a 29.7 ***Have you retained or are you preparing to retain all records applicable to your organic operation for at least 5 years [§205.400(d) and §205.103(b)(3)]?***

☐ Yes ☐ No ☐ n / a 29.8 ***Is the record keeping system sufficient to demonstrate compliance with organic regulations and the Organic Foods Production Act [§205.103(b)(4)]?***

☐ Yes ☐ No ☐ n / a 29.9 ***Are your records available for inspection and copying during normal business hours by authorized representatives of the Secretary of Agriculture, the State organic program, and/or the certifying agent [§205.103(c)]?***

☐ Yes ☐ No ☐ n / a 29.10 ***If you have a split operation, are there adequate records to demonstrate that no commingling occurs?***

Notes on Recordkeeping

Finding Referenced Information Sources

A number of resources are mentioned in the footnote text of this document. Contact information to obtain these materials is provided below.

Acres U.S.A.: Acres U.S.A. is a private business that publishes a monthly sustainable farming magazine under the same name. Acres U.S.A. also publishes and distributes a wide number of books on alternative agriculture and related subjects. To obtain a free book catalog and other information contact:
Acres U.S.A.
P.O. Box 91299
Austin, TX 78709-1299
Tel: 512-892-4400
Fax: 512-892-4448
E-mail: info@acresusa.com
Website: http://www.acresusa.com/magazines/magazine.htm

Alternative Farming Systems Information Center: AFSIC is one of several information centers at the National Agricultural Library (NAL) that provide in-depth coverage of specific subject areas relating to the food and agricultural sciences. AFSIC focuses on alternative farming systems that aim at maintaining agricultural productivity and profitability, while protecting natural resources. Such systems include sustainable, low-input, regenerative, Biodynamic, or organic farming and gardening.
Alternative Farming Systems Information Center
National Agricultural Library, Room 304
10301 Baltimore Avenue
Beltsville, MD 20705-2351
Tel: 301-504-6559
Fax: 301-504-6409
E-mail: afsic@nal.usda.gov
Website: http://www.nal.usda.gov/afsic/

ATTRA: ATTRA (Appropriate Technology Transfer for Rural Areas) is a USDA-funded project that is managed by the National Center for Appropriate Technology—a non-profit organization. ATTRA publishes and distributes information on organic and sustainable agriculture. Many of its publications can be directly downloaded from its website. Hard copies and other information and services can be obtained by calling the 800-line phone service.
ATTRA
P.O. Box 3657
Fayetteville, AR 72702-3657
Tel: 800-346-9140
Tel: 479-442-9824
Fax: 479-442-9842
Website: http://www.attra.ncat.org/

Cooperative Extension Service: Every state has one or more land grant universities that provide extension outreach for farmers. Local access to each state's services is usually available at the county level in the person of the "County Agent." Cooperative Extension typically has good information on basic pasture and livestock production practices. While resources pertinent to organic production have been limited, the situation in most states is improving. A listing of addresses for state cooperative extension publications offices is appended to this workbook.

Countryside & Small Stock Journal: *The Countryside & Small Stock Journal* was established in 1917 and targets homesteaders and others in the Voluntary Simplicity movement that seek greater self-reliance. The Journal is of particular value for its frequent articles on small livestock care and production. Organic methods are emphasized.
Countryside & Small Stock Journal
W11564 Hwy 64
Withee, WI 54498
Tel: 715-785-7979
Fax: 715-785-7414
E-mail: csymag@midway.tds.net
Website: http://www.countrysidemag.com/

The Kerr Center for Sustainable Agriculture: The Kerr Center for Sustainable Agriculture is a non-profit foundation in southeastern Oklahoma that focuses on sustainable farming and ranching. It is very active on public policy issues, but also publishes a fair bit of nuts-and-bolts information.
The Kerr Center for Sustainable Agriculture
PO Box 588
Poteau, OK 74953
Tel: 918-647-9123
Fax: 918-647-8712
E-mail: mailbox@kerrcenter.com
Website: http://www.kerrcenter.com

National Organic Program: The National Organic Program (NOP) was created to implement the Organic Foods Production Act of 1990, which is the over-arching legislation behind the federal standards. The NOP's website is the place to go for viewing the Regulations, and to monitor the progress and recommendations of the National Organic Standards Board.
Richard Matthews, Program Manager
National Organic Program
USDA-AMS-TM-NOP
Room 4008—South Building
1400 and Independence Avenue, SW
Washington, DC 20250-0020
Tel: 202-720-3252
Fax: 202-205-7808
E-mail: NOP.Webmaster@usda.gov
Website: http://www.ams.usda.gov/nop/indexIE.htm

Organic Materials Review Institute: The Organic Materials Review Institute (OMRI) is a nonprofit organization whose primary mission is to publish and disseminate generic and specific (brand name) lists of materials allowed and prohibited for use in the production, processing, and handling of organic food and fiber. OMRI also conducts scientific research and education on the use of materials by the organic industry. Subscriptions to OMRI include the current generic and brand name supplier lists, with periodic updates and a quarterly newsletter.
OMRI
Box 11558
Eugene, OR 97440
Tel: 541-343-7600
Fax: 541-343-8971
E-mail: info@omri.org
Website: http://www.omri.org/

SAN: SAN (Sustainable Agriculture Network) is the outreach arm of the SARE (Sustainable Agriculture Research and Education) program, which has been the USDA's primary means of studying and spreading the word about sustainable farming systems. SAN publishes and distributes a number of for-sale books and free publications.
Sustainable Agriculture Publications
210 Hills Building
University of Vermont
Burlington, VT 05405-0082
Tel: 802-656-0484
E-mail: lhendric@zoo.uvm.edu
Website: http://www.sare.org/

Small Farm Today: *Small Farm Today* magazine is published bi-monthly and is dedicated to the preservation and promotion of small farming, rural living, community, sustainability, and agripreneurship. It has many features on livestock production, with particular attention to rare breeds and alternative stock. Health care and management techniques discussed are typically organic in nature.
Small Farm Today
3903 W Ridge Trail Rd
Clark MO 65243-9525
Tel: 573-687-3525
Fax: 573-687-3148
E-mail: smallfarm@socket.net
Website: http://www.smallfarmtoday.com/

Soil Foodweb, Inc.: Soil Foodweb, Inc. publishes books and articles, gives lectures, and does laboratory testing of soils and composts. Publication topics include soil microbiology, soil ecology, farming, orchards, golf/turf, nursery/landscape, forestry, and lawn and garden.
Soil Foodweb, Inc.
1128 NE 2nd St., Suite 120
Corvallis, OR 97330
Tel: 541-752-5066
Fax: 541-752-5142
E-mail: info@soilfoodweb.com>
Website: http://www.soilfoodweb.com/sfi_html/index.html

The Soil and Health Library: This is an electronically accessible free public library offering a tightly focused collection of books on holistic agriculture, holistic health, self-sufficient living, and personal development. Most of the titles in this library are out of print. Some can be quite hard to find; many of these books are old enough to be public domain materials. It is an excellent place to find classic organic farming texts by pioneers such as Albert Howard, Eve Balfour, F.H. King, J.I. Rodale, and Newman Turner.
Website: http://www.soilandhealth.org/

The Stockman Grass Farmer is a publication devoted entirely to the art and science of turning grass into cash flow. *The Stockman Grass Farmer* serves as an information network for grassland farmers sharing the latest in intensive grazing technology and pasture management.
The Stockman Grass Farmer
282 Commerce Park Drive
Ridgeland, MS 39157
Tel: 601-853-1861
Fax: 601-853-8087
E-mail: SGF@StockmanGrassFarmer.com
Website: http://www.stockmangrassfarmer.com


Photo by USDA NRCS

Cooperative Extension Publications Offices and Websites:

Alabama Cooperative Extension Publications
Auburn University
122 Duncan Hall Annex
Auburn University, AL 36849
Tel: 334-844-5690
http://www.aces.edu/dept/extcomm/publications/

University of Alaska Cooperative Extension Service
Attn: Distribution
University of Alaska Fairbanks
PO Box 756180
Fairbanks, AK 99775-6180
Tel: 907-474-7268
Fax: 907-474-2631
E-mail: fycit@uaf.edu
http://www.uaf.edu/coop-ext/publications/

University of Arizona
CALSmart
4042 N. Campbell Avenue
Tucson, AZ 85719-1111
Tel: 520-318-7275
Fax: 520-795-8508
E-mail: pubs@ag.arizona.edu
http://ag.arizona.edu/pubs/

Arkansas Cooperative Extension Publications
University of Arkansas
Division of Agriculture
Cooperative Extension Service
2301 South University Avenue
Little Rock, Arkansas 72204
Tel: 501-671-2000
Fax : 501-671-2209
http://www.aragriculture.org/publications/default.asp

University of Arkansas Agricultural Engineering Publications
http://www.aragriculture.org/agengineering/default.asp
(Same address as above.)

University of California, Agriculture and Natural Resources
ANR Communication Services
6701 San Pablo Avenue
Oakland, CA 94608-1239
Tel: 510-642-2431 or 800-994-8849
E-mail: anrcatalog@ucdavis.edu
http://anrcatalog.ucdavis.edu
or
1441 Research Park Drive
Davis, CA 95616
Tel: 530-757-8930

Colorado State University
Cooperative Extension
1 Administration Building
Colorado State University
Fort Collins, CO 80523-4040
Tel: 970-491-6281
Fax: 970-491-6208
http://www.cerc.colostate.edu/

University of Connecticut
Cooperative Extension
Communications and Information Technology
1376 Storr Road, Unit 435
University of Connecticut
Storrs, CT 06269-4035
Tel: 860-486-3336
Fax: 860-486-0100 or 860-486-3334
E-mail: store@canr.cag.uconn.edu
http://www.canr.uconn.edu/ces/ (CES homepage)
or
http://137.99.85.230/FMPro?-db=products.fp3&-token=63&-format=browse.htm&-lay=cgi&-sortfield=Category&category=New%20Publications&-find#

University of Delaware
College of Agriculture and
Natural Resources
Cooperative Extension
Newark, DE 19716
Tel: 302-831-2791
http://ag.udel.edu/extension/Information/publications_from_the_university.htm

University of Florida Extension
Institute of Food and Agricultural Sciences
Gainesville, FL 32611
E-mail: cmh@gnv.ifas.ufl.edu
http://edis.ifas.ufl.edu/

University of Georgia
College of Agricultural and Environmental Sciences
Cooperative Extension Service
Athens, GA 30602
http://www.ces.uga.edu/ces/pubs.html

Publications and Information Office
College of Tropical Agriculture and Human Resources
3050 Maile Way, Gilmore Hall 119
University of Hawaii at Manoa
Honolulu, HI 96822
Tel: 808-956-7046
E-mail: ctahrpub@hawaii.edu
http://www2.ctahr.hawaii.edu/oc/

University of Idaho Extension
Agricultural Publications
University of Idaho
Moscow, ID 83844-2240
Tel: 208-885-7982
Fax: 208-885-4648
E-mail: cking@uidaho.edu
http://info.ag.uidaho.edu/Catalog/catalog.htm

University of Illinois
Office of Extension and Outreach
214 Mumford Hall (MC-710)
1301 W. Gregory Dr.
Urbana, IL 61801
Tel: 217-333-5900
E-mail: extension@aces.uiuc.edu
http://www.extension.uiuc.edu/pubs.html

Purdue Cooperative Extension (Indiana)
Tel: 888-398-4636)
E-mail: extension@aes.purdue.edu
http://www.agcom.purdue.edu/AgCom/Pubs/menu.htm

Iowa State University Extension
Extension Distribution Center
119 Printing and Publications Building
Iowa State University
Ames, Iowa 50011-3171
Tel: 515-294-5247
Fax: 515-294-2945
E-mail: pubdist@iastate.edu
http://www.exnet.iastate.edu/pubs/

Kansas State University Extension
Production Services
Kansas State University
24 Umberger Hall
Manhattan, KS 66506-3402
Tel: 785-532-5830
Fax: 785-532-7938
E-mail: orderpub@lists.oznet.ksu.edu
http://www.oznet.ksu.edu/library/

University of Kentucky
College of Agriculture
Cooperative Extension Service
Ag Communications Services
131 Scovell Hall
Lexington, KY 40546-0064
Tel: 859-257-4736
Fax: 859-323-1051
http://www.ca.uky.edu/coahome/pubs.htm

Louisiana State University
Cooperative Extension Service
LSU Agricultural Center
P.O. Box 25203
101 Efferson Hall
Baton Rouge, LA 70894-5203
Tel: 225-578-2263
E-mail: communications@agctr.lsu.edu
http://www.agctr.lsu.edu/nav/pubcatalog.htm

University of Maine Cooperative Extension
UMCE Communications Office
5741 Libby Hall, Room 110
Orono, ME 04469-5741
Tel: 207-581-3269
Fax: 207-581-1387
E-mail: tnelson@umext.maine.edu
http://www.umext.maine.edu/publications/catalog.htm

University of Maryland Cooperative Extension
College of Agriculture and Natural Resources
http://www.agnr.umd.edu/MCE/Publications/index.cfm

University of Massachusetts Extension
UMass Extension Bookstore
Draper Hall
40 Campus Center Way
Amherst, MA 01003-9244
Fax: 413-545-5174
E-mail: books@umext.umass.edu
http://www.umass.edu/umext/bookstore/

Michigan State University Extension
108 Agriculture Hall
East Lansing, MI 48824-1039
Tel: 517-355-2308
Fax: 517-355-6473
E-mail: msue@msue.msu.edu
http://ceenet.msue.msu.edu/bulletin/ctlgmast.html

University of Minnesota Extension Service
Extension Distribution Center
405 Coffey Hall
420 Eckles Avenue
University of Minnesota
St. Paul, MN 55108-6068
Tel: 612-624-4900 or 800-876-8636
Fax: 612-625-6281
E-mail: order@extension.umn.edu
http://www.extension.umn.edu/units/dc/

Mississippi State University Extension Service
http://msucares.com/pubs/index.html

University of Missouri Outreach and Extension
E-mail: communicationse@umsystem.edu
http://extension.missouri.edu/main/publications.shtml

Montana State University Extension Service
Extension Publications
P.O. Box 172040
Montana State University
Bozeman, MT 59717-2040
Tel: 406-994-3273
E-mail: orderpubs@montana.edu
http://www.montana.edu/wwwpb/pubs/

University of Nebraska Cooperative Extension
Extension Publications
IANR Communications & Information Technology
Box 830918
Lincoln, NE 68583-0918
Fax: 402-472-0542
E-mail: tmcgill@unl.edu
http://www.ianr.unl.edu/pubs/browse.htm

University of Nevada Cooperative Extension
Tel: 775-784-7070
E-mail: gooda@unce.unr.edu
http://www.unce.unr.edu/pubs.html

University of New Hampshire Cooperative Extension
UNH Cooperative Extension Publication Center
Nesmith Hall, 131 Main Street
Durham, NH 03824-3597
Tel: 603-862-2346
Fax: 603-862-2441
E-Mail: ce.pubs@unh.edu
http://ceinfo.unh.edu/pubs.htm

Rutgers Cooperative Extension—New Jersey
Administrative office:
Rutgers Cooperative Extension
Cook College
Rutgers
88 Lipman Dr.
New Brunswick, NJ 08901-8525
Tel: 732-932-9306
http://www.rce.rutgers.edu/pubs/index.html

New Mexico State University Cooperative Extension
Agricultural Communications—Bulletin Office
Box 30003, MSC 3AI
New Mexico State University
Las Cruces, NM 88003-8003
Tel: 505-646-2701
E-mail: bulletin@nmsu.edu
http://www.cahe.nmsu.edu/pubs/

Cornell Cooperative Extension—New York
Cornell University Resource Center
7 Business & Technology Park
Ithaca, NY 14850
Tel: 607-255-2080
Fax: 607-255-9946
E-mail: resctr@cornell.edu
http://www.cce.cornell.edu/publications/catalog.html

North Carolina State University Cooperative Extension
http://www.ces.ncsu.edu/resources/

North Dakota State University Extension Service
Distribution Center, NDSU Extension Service
Morrill Hall, P.O. Box 5655
North Dakota State University
Fargo, ND 58105-5655
Tel: 701-231-7882
Fax: 701-231-7044
E-mail: dctr@ndsuext.nodak.edu
http://www.ext.nodak.edu/extpubs/

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Media Distribution
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2021 Coffey Rd.
Columbus, Ohio 43210-1044
Tel: 614-292-1607
Fax: 614-292-1248
E-mail: pubs@ag.osu.edu
http://ohioline.osu.edu/lines/farm.html

Oklahoma State University Cooperative Extension Service
University Mailing Services
Oklahoma State University
Stillwater, OK 74078
Tel: 405-744-5385
http://agweb.okstate.edu/pearl/

Oregon State University Extension
Publication Orders
Extension & Station Communications
Oregon State University
422 Kerr Administration
Corvallis, OR 97331-2119
Fax: 541-737-0817)
E-mail: puborders@orst.edu
http://wwwagcomm.ads.orst.edu/agcomwebfile/EdMat/default.html

Penn State Cooperative Extension
Publications Distribution Center
The Pennsylvania State University
112 Agricultural Administration Building
University Park, PA 16802-2602
Tel: 814-865-6713
Fax: 814-863-5560
E-mail: AgPubsDist@psu.edu
http://pubs.cas.psu.edu/Subject.html

University of Rhode Island Cooperative Extension
Cooperative Extension Education Center
College of the Environment and Life Sciences
3 East Alumni Avenue
University of Rhode Island, Kingston, RI 02881
Tel: 401-874-2900
Fax: 401-874-2259
http://www.uri.edu/ce/factsheets/

Clemson University Cooperative Extension Service—South Carolina
Public Information Specialist
A-101 Poole Ag. Center
Clemson University
Clemson, S.C. 29634
Tel: 864-656-3876
Fax: 864-656-0742
E-Mail: sbeding@clemson.edu
http://www.clemson.edu/psapublishing/DIGITAL.HTM

South Dakota State University Cooperative Extension Service
http://sdces.sdstate.edu/

Tennessee State University Cooperative Extension
http://www.tnstate.edu/cep/

University of Tennessee Agriculture Extension Service
Marketing & Communications Services
Institute of Agriculture
University of Tennessee
104 Morgan Hall
Knoxville, TN 37901-1071
Tel: 865-974-7141
Fax: 865-974-9433
http://www.utextension.utk.edu/publications/default.asp

Texas A&M University Cooperative Extension
Distribution and Supply
P.O. Box 1209
Bryan, Texas 77806
Tel: 888-900-2577
Fax: 979-862-1566
E-mail: Texaserc@tamu.edu
http://texaserc.tamu.edu/catalog/index.html

Utah State University Cooperative Extension
Utah State University
Extension Bulletin Room #202
8960 Old Main Hill
Logan, UT 84322-8960
Tel: 435-797-2251
http://extension.usu.edu/publica/index.htm

University of Vermont Extension
CTR: Publications
Agricultural Engineering Building
University of Vermont
Burlington, VT 05405-0004
http://ctr.uvm.edu/ctr/elecpubs.htm

Virginia Cooperative Extension
http://www.ext.vt.edu/resources/

Washington State University Cooperative Extension
Bulletin Office
Washington State University
Box 645912
Pullman, WA 99164-5912
Tel: 509-335-2857
http://pubs.wsu.edu/

West Virginia University Extension Service
Offices of Communications and Technology.
West Virginia University Extension Service
507 Knapp Hall
Morgantown, WV 26506-6031
Tel: 304-293-4221
Fax: 304-293-6611
http://www.wvu.edu/~exten/infores/pubs.htm

University of Wisconsin Extension
Cooperative Extension Publications
45 North Charter Street
Madison, WI 53715
Tel: 608-262-3346
Fax: 608-265-8052
E-mail: breitzman@admin.uwex.edu
http://www1.uwex.edu/ces/pubs/

University of Wyoming Cooperative Extension Service
University of Wyoming
Cooperative Extension Service
P.O. Box 3354
Laramie, WY 82071-3354
http://www.uwyo.edu/ces/pubs3.htm

University of the Virgin Islands
Cooperative Extension
Clarice Clarke, St. Croix
Extension Specialist, Communications
Tel: 340-692-4060
E-mail: cclarke@uvi.edu
http://rps.uvi.edu/CES/comhome.htm

University of Guam Cooperative Extension
Victor T. Artero, Associate Dean / Director CES
CALS Building, Room 206
UOG Station, Mangilao GU 96923
E-mail: vartero@uog9.uog.edu
http://www.uog.edu/cals/site/publications.html

Endnotes

[1] *NCAT's Organic Crops Workbook* is available in PDF format at <http://attra.ncat.org/attra-pub/PDF/cropsworkbook.pdf>.
[2] For information on the Independent Organic Inspectors Association, contact IOIA, P.O. Box 6, Broadus, MT 59317, Tel: 406-436-2031, Website: <http://www.ioia.net/>.
[3] This workbook can be downloaded in PDF format at <http://attra.ncat.org/attra-pub/PDF/livestockworkbook.pdf>.
[4] "A sustainable agriculture provides nourishing food, protects those who work the land, helps stabilize the earth's climate, and safeguards soil and water." *Asilomar Declaration, California, 1990.* "A sustainable agriculture is one that, over the long term, enhances the environmental quality and the resource base on which agriculture depends; provides for basic human food and fiber needs; is economically viable; and enhances the quality of life for farmers and society as a whole." *American Society of Agronomy*
[5] You may also wish to use the *National Organic Program Compliance Checklist for Producers*, available from ATTRA at <http://attra.ncat.org/attra-pub/PDF/compliance.pdf>.
[6] *Humus* refers to the relatively stable state that organic plant and animal materials achieve following decomposition in the soil or compost pile.
[7] For more information on the history of organic farming, see ATTRA's *Overview of Organic Crop Production* at <http://attra.ncat.org/attra-pub/organiccrop.html>. To access some of the classic texts on humus farming visit the Soil and Health Library website at <http://www.soilandhealth.org/>.
[8] OFPA text can be found on the National Organic Program website at <http://www.ams.usda.gov/nop/archive/OFPA.html>.
[9] For more information on federal regulation of organic farming, visit the website of the National Organic Program at <http://www.ams.usda.gov/nop/>. Additional useful information can be accessed on the Organic Trade Association website specifically at <http://www.ota.com/organic/us_standards.html>. Also see ATTRA's *Organic Farm Certification & The National Organic Program* at <http://attra.ncat.org/attra-pub/PDF/organcert.pdf>.
[10] A list of accredited certifiers can be found on the National Organic Program website at <http://www.ams.usda.gov/nop/CertifyingAgents/CertAgenthome.html>.
[11] A sample of a Purchased or Rented Land Verification Form is provided as a template on the Minnesota Department of Agriculture website at <http://www.mda.state.mn.us/esap/organic/sampleforms.pdf>.
[12] A discussion of this subject can be found on the OTA website at <http://www.ota.com/NewYorkTimesJuly16.html>.
[13] The easiest way to access the National Organic Standard is to visit the NOP's website at <http://www.ams.usda.gov/nop>.
[14] For more information, see ATTRA's *Overview of Organic Crop Production* at <http://attra.ncat.org/attra-pub/organiccrop.html>.

[15] For more information, see ATTRA's *Sustainable Pasture Management* at <http://attra.ncat.org/attra-pub/PDF/sustpast.pdf>, *Rotational Grazing* at <http://attra.ncat.org/attra-pub/PDF/rotgraze.pdf>, *Matching Livestock and Forage Resources in Controlled Grazing* at <http://attra.ncat.org/attra-pub/PDF/matchl&f.pdf>, and *Introduction to Paddock Design and Fencing—Water Systems for Controlled Grazing* at <http://attra.ncat.org/attra-pub/paddock.html>. Also see the Kerr Center for Sustainable Agriculture's *Management Intensive Grazing* at <http://www.kerrcenter.com/kerrweb/publications/MIG/mangmnt_intense_graze.htm>, and *Cell Grazing: Getting Started on Your Place* at <http://www.kerrcenter.com/kerrweb/publications/2002_proceedings/cell_grazing.pdf>.

[16] See ATTRA's *Sustainable Poultry: Production Overview* at <http://attra.ncat.org/attra-pub/PDF/poultryoverview.pdf>, *Sustainable Chicken Production* at <http://attra.ncat.org/attra-pub/PDF/chicken.pdf>, *Pastured Poultry* at <http://attra.ncat.org/attra-pub/pasturedpoultry.html>, *Feeding Chickens* at <http://attra.ncat.org/attra-pub/feeding.html>, and *Range Poultry Housing* at <http://attra.ncat.org/attra-pub/PDF/poulthous.pdf>.

[17] ATTRA's publication *Organic Livestock Feed Suppliers* at <http://attra.ncat.org/attra-pub/livestockfeed.html> may prove useful in finding feed sources. ATTRA's *Sources for Organic Fertilizers & Amendments* at <http://attra.ncat.org/attra-pub/orgfert.html> also provides the names of many suppliers of kelp and mineral products that are often available in feed-grade formulations.

[18] ATTRA has generic OSP forms available in the publication *Creating an Organic Production and Handling System Plan: A Guide to Organic Plan Templates* at <http://attra.ncat.org/attra-pub/handlingsys.html>. Unfortunately, at the time of this writing, these templates have not been designed to accommodate all the needs of livestock operations.

[19] A sample map is provided on the Minnesota Department of Agriculture website at <http://www.mda.state.mn.us/esap/organic/sampleforms.pdf>.

[20] See ATTRA's *Sources of "Spraying Prohibited" Signs for Organic Farms* at <http://attra.ncat.org/attra-pub/sprayingpro.html>.

[21] A sample of a neighbor notification letter is provided in template form on the Minnesota Department of Agriculture website at: <http://www.mda.state.mn.us/esap/organic/sampleforms.pdf>.

[22] A sample of an adjoining land use verification form is provided as a template on the Minnesota Department of Agriculture website at: <http://www.mda.state.mn.us/esap/organic/sampleforms.pdf>.

[23] Guidelines are provided in the Minnesota Department of Agriculture Factsheet *Pesticide Drift and Misuse* at <http://www.mda.state.mn.us/appd/pesticides/drift.pdf>.

[24] For an interesting article on farm biodiversity, see "Farming with the Wild: Agriculture and the Biodiversity Crisis" in *Biodiversity*, Vol. 11, No. 1. (Winter 2001) at <http://www.cgbd.org/visitor/publications/biodiversity_winter01.pdf>.

[25] ATTRA has information on herbal pastures and non-traditional forages available on request; it also has a publication titled *Intercropping Principles and Production Practices* at <http://www.attra.ncat.org/attra-pub/PDF/intercrop.pdf>. Planting and maintaining diverse forage species in a single field is an example of intercropping. A somewhat dated but recommended classic book on the subject, *Fertility Pastures and Cover Crops* by Newman Turner, is still available. For information on ordering, contact the Soil and Health Library website, provided in the resource section.

[26] There is additional information on crop rotation in *NCAT's Organic Crops Workbook* at <http://attra.ncat.org/attra-pub/PDF/cropsworkbook.pdf>. Also recommended is SAN's *Managing Cover Crops Profitably, 2nd edition* at <http://www.sare.org/handbook/mccp2/index.htm>, and Saskatchewan's *Principles and Practices of Crop Rotation*, at <http://www.agr.gov.sk.ca/docs/crops/integrated_pest_management/soil_fertility_fertilizers/cpc0397.asp>.

[27] See ATTRA's *Overview of Cover Crops and Green Manures* at <http://attra.ncat.org/attra-pub/PDF/covercrop.pdf>, SAN's *Managing Cover Crops Profitably, 2nd edition* at <http://www.sare.org/handbook/mccp2/index.htm>, and Ohio State's *Cover Crop Fundamentals* at <http://ohioline.osu.edu/agf-fact/0142.html>.

[28] See ATTRA's *Pursuing Conservation Tillage Systems for Organic Crop Production* at <http://attra.ncat.org/attra-pub/PDF/omconservtill.pdf>.
[29] See ATTRA's *Agroforestry Overview* at <http://attra.ncat.org/attra-pub/PDF/agrofor.pdf>, The Kerr Center for Sustainable Agriculture's *Agroforestry Practices* at <http://www.kerrcenter.com/kerrweb/publications/Agroforestry.htm>, and the NRCS publications *Agroforestry for Farms and Ranches* at <http://www.unl.edu/nac/farms-ranches.pdf> and *Working Trees for Livestock* at <http://www.unl.edu/nac/brochures/wtl/wtl.pdf>.
[30] See ATTRA's *Multi-Species Grazing* at <http://attra.ncat.org/attra-pub/PDF/multispecies.pdf>.
[31] See ATTRA's *Farmscaping to Enhance Biological Control* at <http://attra.ncat.org/attra-pub/PDF/farmscaping.pdf>.
[32] For a description of cation balancing and a discussion of the issues as they relate primarily to soils and crop production see the Virginia Association for Biological Farming's *Soil Cation Nutrient Balancing in Sustainable Agriculture* at <http://www.vabf.org/soilre1.php> and *Does My Soil Need Cation Nutrient Balancing?* at <http://www.vabf.org/soilre2.php>. Perhaps the two best books relating cation balancing to animal health are *The Albrecht Papers Vol. II: Soil Fertility and Animal Health*, available from Acres USA, and *The Dairy Nutrition Manual*, available from Midwestern Bio-Ag, Hwy ID, Box 126, Blue Mounds, WI 53517, 608-437-4994. For good information on implementing soil cation balancing that is sensitive to organic management, try Gary Zimmer's *The Biological Farmer*—available from Acres USA. Also see ATTRA's *Sustainable Soil Management* at <http://www.attra.org/attra-pub/PDF/soilmgmt.pdf>. See ATTRA's *Alternative Soil Testing Laboratories* at <http://attra.ncat.org/attra-pub/soil-lab.html> for laboratories that provide tests and recommendations that include base saturation.
[33] A number of commercial soil testing laboratories provide organic fertilizer recommendations. See ATTRA's *Alternative Soil Testing Laboratories* at <http://attra.ncat.org/attra-pub/soil-lab.html>. The University of Georgia's publication *How to Convert an Inorganic Fertilizer Recommendation to an Organic One* at <http://www.ces.uga.edu/pubs/PDF/C853.pdf> may also be helpful.
[34] See ATTRA's *Manures for Organic Crop Production* at <http://attra.ncat.org/attra-pub/PDF/manures.pdf>.
[35] See ATTRA's *Alternative Soil Amendments* at <http://attra.ncat.org/attra-pub/PDF/altsoil.pdf>.
[36] For more details see *NCAT's Organic Crops Workbook* at <http://attra.ncat.org/attra-pub/PDF/cropsworkbook.pdf>.
[37] See ATTRA's *Overview of Cover Crops and Green Manures* at <http://attra.ncat.org/attra-pub/PDF/covercrop.pdf> and *NCAT's Organic Crops Workbook* at <http://attra.ncat.org/attra-pub/PDF/cropsworkbook.pdf>.
[38] ATTRA is developing further information on a number of esoteric practices. Currently available is ATTRA's *Biodynamic Farming & Compost Preparation* at <http://attra.ncat.org/attra-pub/PDF/biodynam.pdf>. For information on radionics see *Radionics in Agriculture* at <http://home.earthlink.net/~gkuepper/index/Radionics.htm>. For in-depth reading on a wide range of esoteric agricultural practices, see the books *Secrets of the Soil and Stone Age Farming*, available from Acres, USA.
[39] See *NCAT's Organic Crops Workbook* at <http://attra.ncat.org/attra-pub/PDF/cropsworkbook.pdf>. Also see ATTRA's *Overview of Cover Crops and Green Manures* at <http://attra.ncat.org/attra-pub/PDF/covercrop.pdf>, SAN's *Managing Cover Crops Profitably, 2nd edition* at <http://www.sare.org/handbook/mccp2/index.htm> and Ohio State's *Cover Crop Fundamentals* at <http://ohioline.osu.edu/agf-fact/0142.html>.
[40] See ATTRA's *Alternative Soil Amendments* at <http://attra.ncat.org/attra-pub/PDF/altsoil.pdf> and *Sources for Organic Fertilizers & Amendments* at <http://attra.ncat.org/attra-pub/orgfert.html>.
[41] See ATTRA's *Alternative Soil Amendments* at <http://attra.ncat.org/attra-pub/PDF/altsoil.pdf> and *Sources for Organic Fertilizers & Amendments* at <http://attra.ncat.org/attra-pub/orgfert.html>.
[42] See ATTRA's *Foliar Fertilization* at <http://attra.ncat.org/attra-pub/PDF/foliar.pdf>.
[43] See The Kerr Center for Sustainable Agriculture's *Pasture Legumes: Establishment and Management* at <http://www.kerrcenter.com/kerrweb/publications/legumes.html>.

[44] See *NCAT's Organic Crops Workbook* at <http://attra.ncat.org/attra-pub/PDF/cropsworkbook.pdf>.
[45] See ATTRA's *Manures for Organic Crop Production* at <http://attra.ncat.org/attra-pub/PDF/manures.pdf>.
[46] See ATTRA's *Alternative Soil Amendments* at <http://attra.ncat.org/attra-pub/PDF/altsoil.pdf> and *Sources for Organic Fertilizers & Amendments* at <http://attra.ncat.org/attra-pub/orgfert.html>.
[47] For guidance on determining optimum forage residual heights, see ATTRA's *Sustainable Pasture Management* at <http://attra.ncat.org/attra-pub/PDF/sustpast.pdf>, *Assessing the Pasture Soil Resource* at <http://attra.ncat.org/attra-pub/pastsoil.html>, and *Rotational Grazing* at <http://attra.ncat.org/attra-pub/PDF/rotgraze.pdf>.
[48] A widely read and respected periodical is the *Stockman-Grass Farmer* (see the Resources Section). Also see ATTRA's *Sustainable Pasture Management* at <http://attra.ncat.org/attra-pub/PDF/sustpast.pdf>, *Rotational Grazing* at <http://attra.ncat.org/attra-pub/PDF/rotgraze.pdf>, *Matching Livestock and Forage Resources in Controlled Grazing* at <http://attra.ncat.org/attra-pub/PDF/matchl&f.pdf>, and *Introduction to Paddock Design and Fencing—Water Systems for Controlled Grazing* at <http://attra.ncat.org/attra-pub/PDF/paddock.pdf>, along with the Kerr Center for Sustainable Agriculture's *Cell Grazing: Getting Started on Your Place* at <http://www.kerrcenter.com/kerrweb/publications/2002_proceedings/cell_grazing.pdf> and *Management Intensive Grazing* at <http://www.kerrcenter.com/kerrweb/publications/MIG/mangmnt_intense_graze.htm>.
[49] Many state extension offices have lists of organic fertilizers and amendments featuring their N-P-K values and other information. Two good on-line sources are North Carolina's *Nutrient Content of Fertilizer and Organic Materials* at <http://www.soil.ncsu.edu/publications/Soilfacts/AG-439-18/> and Cornell University's *A Guide to the Nutrient Value of Organic Materials* at <http://www.cce.cornell.edu/counties/Suffolk/grownet/organic/nutrient.html>. A publication that might also be useful is the University of Georgia's *How to Convert an Inorganic Fertilizer Recommendation to an Organic One* at <http://www.ces.uga.edu/pubcd/C853.htm>.
[50] See Rutgers University's *Agricultural Liming Materials* at <http://www.rce.rutgers.edu/pubs/pdfs/fs905.pdf>.
[51] Contact information for OMRI can be found in the Resources Section of this workbook.
[52] See ATTRA's *Protecting Water Quality on Organic Farms* at <http://attra.ncat.org/attra-pub/PDF/omwaterquality.pdf>.
[53] For more information see Charles Walter's *Weeds, Control Without Poisons* (Acres USA), ATTRA's *Principles of Sustainable Weed Management for Croplands* at <http://attra.ncat.org/attra-pub/PDF/weed.pdf>, and SAN's *A Whole-Farm Approach to Managing Pests* at <http://www.sare.org/bulletin/farmpest/>.
[54] See ATTRA's *Sustainable Pasture Management* at <http://attra.ncat.org/attra-pub/PDF/sustpast.pdf>, *Rotational Grazing* at <http://attra.ncat.org/attra-pub/PDF/rotgraze.pdf>, and *Matching Livestock and Forage Resources in Controlled Grazing* at <http://attra.ncat.org/attra-pub/PDF/matchl&f.pdf>.
[55] See ATTRA's *Benefits of Multispecies Grazing* <http://attra.ncat.org/attra-pub/PDF/multispecies.pdf>.
[56] See Ehrenfried Pfeiffer's *Weeds and What They Tell* and Jay McCaman's *Weeds and Why They Grow*, both available from Acres USA.
[57] See *NCAT's Organic Crops Workbook* at <http://attra.ncat.org/attra-pub/PDF/cropsworkbook.pdf> for more information on weed management in rotation crops.
[58] See ATTRA's *Farmscaping to Enhance Biological Control* at <http://attra.ncat.org/attra-pub/PDF/farmscaping.pdf>.
[59] See ATTRA's *Flame Weeding for Agronomic Crops* at <http://attra.ncat.org/attra-pub/PDF/flameweed.pdf>. Note that most of the information in this publication is primarily intended for row crop production.
[60] For a brief description of weed biocontrol, see the Organic Agriculture Centre of Canada's *Research Report 2002—Biological Weed Control* at <http://www.organicagcentre.ca/docs/9-4.pdf>.
[61] See *NCAT's Organic Crops Workbook* section V., "Supporting Biodiversity and the Rotation Practice Standard", for information on crop diversity and crop rotation.

[62] ATTRA has information on managing these pests. For example, see ATTRA's *Grasshopper Management* at <http://attra.ncat.org/attra-pub/PDF/grasshopper.pdf>.
[63] See ATTRA's *Organic Alfalfa Production* at <http://attra.ncat.org/attra-pub/PDF/alfalfa.pdf>.
[64] NCAT's *Organic Crops Workbook* can be found at <http://attra.ncat.org/attra-pub/PDF/cropsworkbook.pdf>.
[65] See ATTRA's *Biointensive Integrated Pest Management* at <http://attra.ncat.org/attra-pub/PDF/ipm.pdf>, SAN's *A Whole-Farm Approach to Managing Pests* at <http://www.sare.org/bulletin/farmpest/>, and Ohio State's *Sticky Traps: A Useful Tool for Pest-Scouting Programs* at <http://ohioline.osu.edu/hyg-fact/1000/1033.html>. Most Cooperative Extension offices have further information on IPM.
[66] See ATTRA's *Farmscaping to Enhance Biological Control* at <http://attra.ncat.org/attra-pub/PDF/farmscaping.pdf>.
[67] To locate sources of beneficial insects, see Ohio State's *Commercial Suppliers of Beneficial Organisms* at <http://ohioline.osu.edu/hyg-fact/2000/2122.html>.
[68] Several good general resources on organic pest control agents are available. Among them are University of Connecticut's *Pesticides for Organic Growers* and *Ignoring Labels on Organic Products Can Cause Problems.* Use the search feature at <http://www.hort.uconn.edu/ipm/> to locate both of these publications. Also note that more detail on alternative pesticides is provided in *NCAT's Organic Crops Workbook* at <http://attra.ncat.org/attra-pub/PDF/cropsworkbook.pdf>.
[69] For more information on beneficial insects, see Oklahoma State's *Beneficial Insects* at <http://pearl.agcomm.okstate.edu/insects/home/f-7307.pdf> (you may need to locate the publication using the search feature at <http://pearl.agcomm.okstate.edu/>) and Purdue University's *Common Natural Enemies* at <http://www.entm.purdue.edu/Entomology/ext/targets/e-series/EseriesPDF/E-92.pdf>.
[70] Appendix B of ATTRA's *Biointensive Integrated Pest Management* at <http://www.attra.org/attra-pub/PDF/ipm.pdf> features a list of microbial pesticides, trade names, and suppliers. Most of these are permitted in certified organic production.
[71] For more information on botanical pesticides, see Cornell University's *Nature's Botanical Insecticide Arsenal* at <http://www.cce.cornell.edu/counties/Suffolk/grownet/organic/botinsct.htm>. Also see Oklahoma State's *Botanical Pest Controls* at <http://pearl.agcomm.okstate.edu/hort/ornamental/f6433.htm>. (You can also locate the publication using the search feature at <http://pearl.agcomm.okstate.edu/>.)
[72] For more information on insecticidal soaps, see the University of Connecticut's *Insecticidal Soaps.* To locate this publication, use the search feature at the University of Connecticut IPM website at <http://www.hort.uconn.edu/ipm/>.
[73] For assistance in locating sources of organic seeds and planting stock, see ATTRA's *Suppliers of Seed for Certified Organic Production (Including Untreated and Non-GMO Seed)* at <http://attra.ncat.org/attra-pub/altseed.html>. OMRI is developing a listing of certified organic seed and planting stock producers. See the *OMRI Seed and Planting Stock List* at <http://www.omri.org/OMRI_SEED_list.html>.
[74] Details are provided in *NCAT's Organic Crops Workbook* at <http://attra.ncat.org/attra-pub/PDF/cropsworkbook.pdf>.
[75] ATTRA has forms for recording your search for organic seeds and planting stock in *Organic Livestock Documentation Forms* at <http://www.attra.ncat.org/attra-pub/PDF/livestockforms.pdf>.
[76] The presence of subsurface compaction can be found by using a penetrometer. Instructions for making and using a simple homemade penetrometer can be found in ATTRA's *Assessing the Pasture Soil Resource* at <http://attra.ncat.org/attra-pub/pastsoil.html>.
[77] A "Fertility / Soil Monitoring Log" is included in ATTRA's *Organic Livestock Documentation Forms* at <http://attra.ncat.org/attra-pub/PDF/livestockforms.pdf>.
[78] See ATTRA's *Sustainable Soil Management* at <http://attra.ncat.org/attra-pub/PDF/soilmgmt.pdf> for more information on earthworms.
[79] See ATTRA's *Dung Beetle Benefits in the Pasture Ecosystem*, at <http://attra.ncat.org/attra-pub/PDF/dungbeetle.pdf>.

[80] For more information on grass tetany, see the University of Nevada's *Grass Tetany in Beef Cattle* at <http://www.forages.css.orst.edu/Topics/Pastures/Species/Grasses/Animal_issues/Tetany.html>.
[81] For more information on prussic acid poisoning, see Purdue University's *Minimizing the Prussic Acid Poisoning Hazard in Forages* at <http://www.forages.css.orst.edu/Topics/Pastures/Species/Grasses/Animal_issues/Prussic_Minimizing.html>.
[82] For more information on nitrate poisoning see the University of Nevada's *Nitrate Poisoning* at <http://www.forages.css.orst.edu/Topics/Pastures/Species/Grasses/Animal_issues/Nitrate.html>.
[83] For a discussion of endophyte toxicity in fescue, see *The Tall Fescue Endophyte Story* at <http://www.caf.wvu.edu/~forage/fescue_endophtye/story.htm>.
[84]See the Kerr Center for Sustainable Agriculture's *Riparian Area Management Techniques* at <http://www.kerrcenter.com/kerrweb/publications/riparian.pdf>.
[85] For more information, see ATTRA's *Sustainable Pasture Management* at <http://attra.ncat.org/attra-pub/PDF/sustpast.pdf>, *Rotational Grazing* at <http://attra.ncat.org/attra-pub/PDF/rotgraze.pdf>, *Matching Livestock and Forage Resources in Controlled Grazing* at <http://attra.ncat.org/attra-pub/matchlandf.html>, and *Introduction to Paddock Design and Fencing-Water Systems for Controlled Grazing* at <http://attra.ncat.org/attra-pub/PDF/paddock.pdf>. Also see the Kerr Center for Sustainable Agriculture's *Management Intensive Grazing* at <http://www.kerrcenter.com/kerrweb/publications/MIG/mangmnt_intense_graze.htm> and *Cell Grazing: Getting Started on Your Place* at <http://www.kerrcenter.com/kerrweb/publications/2002_proceedings/cell_grazing.pdf>.
[86] For additional information on water quality for livestock, see Colorado State's *Livestock Drinking Water Quality* at <http://www.ext.colostate.edu/pubs/livestk/04908.html>.
[87] To be more precise, §205.237(b)(2) reads: "The producer of an organic operation must not…[p]rovide feed supplements or additives in amounts above those needed for adequate nutrition and health maintenance for the species at its specific stage of life."
[88] Contact information for OMRI can be found in the Resources Section of this workbook.
[89] See ATTRA's *Hooped Shelters for Hogs* at <http://attra.ncat.org/attra-pub/PDF/hooped.pdf>.
[90] See ATTRA's *Organic Alternatives to Treated Lumber* at <http://attra.ncat.org/attra-pub/PDF/lumber.pdf>.
[91] *Moving 'Em* by Burt Smith and *Stockmanship* by Bud Williams are both considered leading works on the subject. Both books are available through *The Stockman Grass Farmer* (see Resources Section). Also recommended is Dr. Temple Grandin's webpage <http://www.grandin.com/> and Colorado State's *Livestock Handler's Safety* at <http://www.ext.colostate.edu/pubs/livestk/01813.html>.
[92] An excellent reference book for structural and household pest management is *Common-Sense Pest Control* by Olkowski, Daar, and Olkowski. This book is available from Acres, USA.
[93] See Ohio State's "Composting Livestock Mortalities" at <http://www.oardc.ohio-state.edu/fabe/composting.htm>, the University of Minnesota's "Composting Is The Natural Way To Dispose Of Dead Animals" at <http://www.extension.umn.edu/extensionnews/1997/JN1329.html>, and Penn State's "Dead Pig Composting" at <http://www.penpages.psu.edu/penpages_reference/28901/28901209.HTML>. In addition, the Water Quality Program of the University of Missouri Outreach and Extension has guide sheets on dead animal regulation and composting. Request guide sheets WQ 205-WQ 211, WQ 216 and WQ 225 at <http://www.fse.missouri.edu/waterquality/wqprograms/composting.htm>.
[94] *NCAT's Organic Crops Workbook* can be found at <http://attra.ncat.org/attra-pub/PDF/cropsworkbook.pdf>. Also see ATTRA's *Manures for Organic Crop Production* at <http://attra.ncat.org/attra-pub/PDF/manures.pdf>. Also helpful is North Carolina State's *Components of a Complete Manure Management Plan* at <http://www.bae.ncsu.edu/bae/programs/extension/publicat/wqwm/ebae185_93.html>.

[95] See ATTRA's *Farm-Scale Composting Resource List* at <http://attra.ncat.org/attra-pub/PDF/farmcompost.pdf>, the University of Missouri's *Making and Using Compost* at <http://muextension.missouri.edu/xplor/agguides/hort/g06956.htm>, the University of Maine's *How Compost Happens* at <http://www.umext.maine.edu/onlinepubs/htmpubs/1159.htm>, and Louisiana State's *Basic Principles of Composting* at <http://www.lsuagcenter.com/Communications/pdfs_bak/compost.PDF>.
[96] Sources of biological control agents and information include Peaceful Valley Farm Supply at <http://www.groworganic.com/>, 530-272-4769; and The Source at <http://www.sourcebiofly.com/>.
[97] See the University of Florida's *Insect Attractants and Traps* at <http://edis.ifas.ufl.edu/BODY_IN080>.
[98] See ATTRA's *Organic Livestock Documentation Forms* at <http://attra.ncat.org/attra-pub/PDF/livestockforms.pdf> for an example of a compost production record.
[99] See Oklahoma State University's *Freeze Branding Cattle* at <http://www.ansi.okstate.edu/exten/beef/FS3250.PDF>.
[100] To learn more about CAVM, the Complementary and Alternative Veterinary Medicine website at <http://www.altvetmed.com/> is recommended.
[101] To find a list of practicing holistic veterinarians, state-by-state, visit the American Holistic Veterinary Medical Association website at <http://www.ahvma.org/> or contact them at 2218 Old Emmorton Road, Bel Air, MD 21015, Tel: 410-569-0795 Fax: 410-569-2346. Other useful resources include the Academy of Veterinary Homeopathy at <http://www.theavh.org/>, or contact them at P.O. Box 9280, Wilmington, DE 19809, Tel: 866-652-1590; the International Association of Veterinary Homeopathy, 2707 76th Avenue, SE, Mercer Island, WA 98040, Tel: 206-232-7667, website <http://www.iavh.at/>; and the Veterinary Botanical Medicine Association, 334 Knollwood Lane, Woodstock, GA 30188, website <http://www.vbma.org/>.
[102] Vaccines are the only inputs that might derive from genetic engineering and still be allowed in organic production [§205.105(e)].
[103] Several books on treatment of livestock using herbs can be found at the 7mFarm & Herbals website at <http://www.7mfarm.com/books.html>. Another excellent source is Acres, USA. One classic book on herbal treatments is Juliette de Bairacli Levy's *The Complete Herbal Handbook for Farm and Stable*, available from both Acres U.S.A. and 7mFarm.
[104] Several books on treatment of livestock using homeopathy can be found at the 7mFarm & Herbals website at <http://www.7mfarm.com/books.html> and at the Homeopathic Educational Services website at <http://www.homeopathic.com/>. Another excellent source for books on homeopathy for livestock is Acres, USA.
[105] A brief description of acupuncture as used by a veterinarian can be found at <http://www.risingsunvet.com/acupun.htm>. Several books on treatment of livestock using acupuncture can be found at the 7mFarm & Herbals website at <http://www.7mfarm.com/books.html>.
[106] Radionics is one of many esoteric practices permitted in organic production. For information on radionics see *Radionics in Agriculture* at <http://home.earthlink.net/~gkuepper/index/Radionics.htm>.
[107] Some brief descriptive information can be found at *Reiki for Animals* at <http://www.adoredbeast.com/july00_2.shtml>.
[108] See ATTRA's *Organic Livestock Documentation Forms* at <http://attra.ncat.org/attra-pub/PDF/livestockforms.pdf> for a Health Care Products: Product Inventory form.
[109] See ATTRA's *Organic Livestock Documentation Forms* at <http://attra.ncat.org/attra-pub/PDF/livestockforms.pdf> for examples of an Individual Organic Animal Health Record and an Organic Poultry Flock Health Record.
[110] See ATTRA's *Integrated Parasite Management for Livestock* at <http://attra.ncat.org/attra-pub/PDF/livestock-ipm.pdf>. Also see Iowa State's *Gastrointestinal Parasites: Natural and/or Old-time Treatments* at <http://www.pfi.iastate.edu/OFR/Anthelmintics.htm>.
[111] Electrotherapies include controversial modalities and tools like the Hulda Clark zapper. For information pro and con see *Zapper: General Information* at <http://www.lifedevice.com/Zapper.htm> and *Fasciolopsis buski* at <http://www.biosci.ohio-state.edu/~parasite/fasciolopsis.html>.

[112] Radionics is one of many esoteric practices allowed in organic production. For information on radionics see *Radionics in Agriculture* at <http://home.earthlink.net/~gkuepper/index/Radionics.htm>.
[113] Several books on treatment of livestock using herbs can be found at the 7mFarm & Herbals website at <http://www.7mfarm.com/books.html>. Another excellent source is Acres, USA. One classic book on herbal treatments is Juliette de Bairacli Levy's *The Complete Herbal Handbook for Farm and Stable*, available from both Acres U.S.A. and 7mFarm.
[114] See ATTRA's *Dung Beetle Benefits in the Pasture Ecosystem*, at <http://attra.ncat.org/attra-pub/PDF/dungbeetle.pdf>.
[115] See the University of Nebraska's *Sanitation for Fly and Disease Management at Confined Livestock Facilities* at <http://ianrpubs.unl.edu/insects/g1175.htm>.
[116] Sources of biological control agents and information include: Peaceful Valley Farm Supply at <http://www.groworganic.com>, 530-272-4769; and The Source at <http://www.sourcebiofly.com/>.
[117] For more information on bats and bat conservation, see Bat Conservation International at <http://www.batcon.org/> and the Organization for Bat Conservation at <http://www.batconservation.org/>.
[118] For information on purple martins, see The Purple Martin Conservation Association at <http://www.purplemartin.org/>.
[119] The University of Kentucky has a discussion on the efficacy and function of the walk-through fly trap, which is most effective for horn flies, at <http://www.uky.edu/Agriculture/Entomology/entfacts/livestc/ef508.htm>. Highly descriptive information on walk-through flytraps can be found in the University of Missouri's *Walk-Through Trap to Control Horn Flies on Cattle* at <http://muextension.missouri.edu/xplor/agguides/agengin/g01195.htm>.
[120] Information on traps for deer and horse flies can be found in the University of Florida's *The Trolling Deer Fly Trap* at <http://extlab1.entnem.ufl.edu/PestAlert/deerfly.htm>. General information on insect traps and their design can be found in the University of Florida's *Insect Attractants and Traps* at <http://edis.ifas.ufl.edu/BODY_IN080>.
[121] Acaricides are pesticides that kill mites and/or ticks.
[122] ATTRA's *Beef Farm Sustainability Checksheet* at <http://attra.ncat.org/attra-pub/PDF/beefchec.pdf> and *Dairy Farm Sustainability Checksheet* at <http://attra.ncat.org/attra-pub/PDF/dairychecksheet.pdf> are also strongly recommended.
[123] For basic information on poultry diseases, see Agriculture Canada's Poultry Fact Sheet #3 at <http://eru.usask.ca/saf_corp/livestok/poultry/diseases.htm>. Also, there is a list of poultry disease links at <http://www.poultryconnection.com/links/Diseases_and_Disorders/>.
[124] See ATTRA's *Predator Control for Sustainable & Organic Livestock Production* at <http://attra.ncat.org/attra-pub/predator.html>.
[125] See the Colorado State's *Livestock Guard Dogs, Llamas and Donkeys* at <http://www.ext.colostate.edu/pubs/livestk/01218.html>.
[126] See Ohio State's "Composting Livestock Mortalities" at <http://www.oardc.ohio-state.edu/fabe/composting.htm>, the University of Minnesota's "Composting Is The Natural Way To Dispose Of Dead Animals" at <http://www.extension.umn.edu/extensionnews/1997/JN1329.html>, and Penn State's "Dead Pig Composting" at <http://www.penpages.psu.edu/penpages_reference/28901/28901209.HTML>. In addition, the Water Quality Program of the University of Missouri Outreach and Extension has guide sheets on dead animal regulation and composting. Request guide sheets WQ 205-WQ 211, WQ 216 and WQ 225 at <http://www.fse.missouri.edu/waterquality/wqprograms/composting.htm>.
[127] ATTRA has information prepared on natural pest control alternatives for grain storage. See *Stored Grain Pest Management* at < http://attra.ncat.org/attra-pub/PDF/storedgrain.pdf>.
[128] See Colorado State's *Formulating Rations With the Pearson Square* at <http://www.ext.colostate.edu/pubs/livestk/01618.html>.
[129] ATTRA has generic Organic System Plan forms available in the publication *Creating an Organic Production and Handling System Plan: A Guide to Organic Plan Templates* at <http://attra.ncat.org/attra-pub/PDF/handlingsys.pdf>. A portion of the publication includes templates for organic handling systems.

[130] ATTRA's *Organic Marketing Resources* at < http://attra.ncat.org/attra-pub/PDF/markres.pdf> is advised reading for those exploring organic marketing options. Also recommended is SAN's *Reap New Profits: Marketing Strategies for Farmers and Ranchers* at < http://www.sare.org/market99/index.htm>. ATTRA also has several publications that specifically address the marketing of livestock products, these include: *Alternative Meat Marketing* at <http://attra.ncat.org/attra-pub/PDF/Altmeat.pdf>, *Alternative Beef Marketing* at < http://attra.ncat.org/attra-pub/PDF/altbeef.pdf>, and *Alternative Marketing of Pork* at < http://attra.ncat.org/attra-pub/PDF/altpork.pdf>.

[131] For an overview of grass-fed beef and chicken production and marketing from a holistic management perspective, see Richard and Peggy Sechrist's article *Organic, Grass-Fed Beef and Chicken: Management and Markets* at <http://www.kerrcenter.com/kerrweb/publications/2002_proceedings/grass-fed_beef.pdf>.

[132] See ATTRA's *Community Supported Agriculture* at <http://attra.ncat.org/attra-pub/PDF/csa.pdf>.

[133] See ATTRA's *Direct Marketing* at <http://attra.ncat.org/attra-pub/PDF/directmkt.pdf>.

[134] See ATTRA's *Farmers' Markets* at < http://attra.ncat.org/attra-pub/PDF/farmmarket.pdf>.

[135] The ATTRA publications *Direct Marketing* at <http://attra.ncat.org/attra-pub/PDF/directmkt.pdf> and *Entertainment Farming & Agri-Tourism* at <http://attra.ncat.org/attra-pub/PDF/entertn.pdf> have information on roadside sales. In addition, Cornell University has building plans and other information available in their Extension publication entitled *Facilities for Roadside Markets* at <http://www.cce.cornell.edu/publications/agriculture.cfm>.

[136] See ATTRA's *Entertainment Farming & Agri-Tourism* at <http://attra.ncat.org/attra-pub/PDF/entertn.pdf>.

[137] In the Julian Date Calendar, each day is assigned a number in sequence from 001 through 365 (366 in leap years). The Julian system is commonly used for product coding. An example of the Julian calendar is featured at <http://www.dscr.dla.mil/sbo1/julian_date_calendar.htm> .

[138] See ATTRA's *Organic Livestock Documentation Forms* at <http://attra.ncat.org/attra-pub/PDF/livestockforms.pdf>.

[139] A sample of a complaint log is provided as a template on the Minnesota Department of Agriculture website at: <http://www.mda.state.mn.us/esap/organic/sampleforms.pdf>.

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