University of Idaho Extension

Organic potato production in Idaho: Nutrient management and variety selection

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INTRODUCTION

Idaho organic potatoes are in high demand by consumers, with 43% of potato buyers reporting a preference for potatoes from Idaho over those from other U.S. states (Greenway, 2009). Potato growers face challenges with providing enough nutrients for their potato crops using organic methods, however. For example, Russet Burbank potatoes require 220 pounds nitrogen (N) per acre, 70 pounds phosphorus (P_2O_5) per acre, 360 pounds potassium (K_2O) per acre, and 20 pounds sulfur (S) per acre to produce a typical 450 cwt per acre tuber yield (Stark et al., 2004). It is imperative to add these nutrients removed by potato plants back to the soil to maintain competitive yields and market quality. However, affordable organic nutrient sources are difficult to find in Idaho, with N being the most difficult to find.

This publication provides recommendations for potato growers to obtain acceptable tuber yields and quality from their organic potatoes. Topics include (1) selecting varieties that may be suited for organic production, (2) adapting recommendations from the University of Idaho Extension publication *Nutrient Management Guidelines for Russet Burbank Potatoes* (bulletin 840), (3) selecting organic nutrient sources, and (4) utilizing green manures, cover crops, and rotation crops to help meet nutrient requirements.

VARIETY SELECTION

Selecting potato varieties best suited for optimal yield and quality under an organic production system is an initial step in successfully growing organic potatoes. The most suitable variety will depend on the intended market—fresh, process, or both. Having a working knowledge of the production attributes of varieties from various market classes will aid growers in determining which variety may be appropriate to grow under organic conditions.

A particular market may designate specific quality characteristics to sell in that market. Once those characteristics have been identified then variety selection can be further narrowed. For example, if the organic potatoes are destined to be processed into French fries or potato chips, they must have a high specific gravity and low reducing sugar concentration to produce an acceptable processed product. Examples of process potato varieties grown in Idaho include Russet Burbank, Alturas, Defender, Yukon Gem, Premier Russet, and Ranger Russet. Fresh market varieties are selected based on color, skin finish, size, shape, and other culinary attributes.

Varieties differ in disease susceptibility, growth habits, nutrient requirements, yield potential, days to maturity, storability, and dormancy length. Each variety is unique, with individual strengths and weaknesses. This makes it very important to choose a variety that works best for your production and storage management systems as well as for the intended final market for the potatoes.

Weed competition can be a management concern with organic potato production. Early and vigorous potato plant emergence can help potato plants compete with early emerging weeds. Rates of emergence among varieties differ considerably and can be used as variety selection criteria if weed pressure is high. For example, Yukon Gold can be slow to emerge in some years.

Varieties also vary in maturity and can be classified into as short-, mid- and late-season varieties. Maturity will impact days to harvest, yield, and nutrient requirements, especially N. Short-season varieties tend to require fewer nutrients compared with late season varieties. However, some late-season varieties, such as Alturas, also have reduced fertility needs.

Disease pressure and control under an organic system can be taxing with limited resources to combat some of the diseases. Select varieties that are less susceptible to the disorder, disease, or pest that is causing the greatest threat to your crop. For example, if late blight is a concern, a grower might consider the variety Defender, which exhibits greater resistance to the disease. Even within a market type (e.g., red, russet, or yellow) varieties vary in disease susceptibility. Fertility and growth habit of a variety can also impact disease symptom expression.

Thousands of potato varieties are cultivated throughout the world, and growers have several hundred to choose from in the United States. Variety selection will be limited by seed availability and certification, however. A comprehensive list and description of several hundred potato varieties can be found at http://potatoes.wsu.edu/varieties/vars-all.htm.

A 3-year University of Idaho study selected just a few varieties to evaluate under an organic field management system. The varieties used in this study could be classified into process, fresh, and dual process/fresh. Production potential under an organic system was evaluated, and total average yield ranged from approximately 200 to 350 cwt/acre (table 1). Although yields were lower than under conventional production in the same area, quality was acceptable for fresh and process markets.

Table 1. Two-year average yield (cwt/acre) of seven potato varieties grown at the University of Idaho's Kimberly Research and Extension Center in Kimberly, Idaho, under an organic field management system.

Potato variety	Market type	Two-year average total yield
Alturas	Process	260
Defender	Process/fresh	262
Russet Burbank	Process/fresh	350
Yukon Gold	Process/fresh	237
Yukon Gem	Process/fresh	335
Dark Red Norland	Fresh	240
Russet Norkotah	Fresh	194

Source: Moore et al. 2011.

The lower yield and size profile of Russet Norkotah makes it an unfavorable variety to grow under an organic system. Processing quality for Russet Burbank, Defender, and Alturas tubers was acceptable, as indicated by high specific gravity (1.08 to 1.10), fry color, and sugar analysis. A 1-year study compared four russet-type varieties, and yields were highest with Russet Burbank (400 cwt/acre) compared with Premier Russet (335 cwt/acre), Alpine Russet (320 cwt/acre), and Classic Russet (212 cwt/acre) (Moore et al., 2011).

Many factors are involved in deciding the ideal variety to grow under an organic system. On-farm trials are often necessary to fine-tune individual farming practices.

FERTILIZER RECOMMENDATIONS

Because organically grown potatoes use nutrients in the same way that conventionally grown potatoes do, the overall fertilizer recommendations are the same. However, because the availability of nutrients from organic sources often depends on the decomposition of plant- and/or animal-based materials by microbes in the soil, factors such as soil testing, nutrient uptake, and yield potential need to be adapted for organic production systems.

Soil testing

Effective soil sampling and soil testing are critical for both conventional and organic potato growers. In addition to following soil sampling recommendations given in *Nutrient Management Guidelines for Russet Burbank Potatoes*, organic growers should include a pre-sidedress nitrogen test (PSNT). The PSNT test is based on a second soil sample taken prior to row closure. The soil sample is analyzed for ammonium and nitrate contents by a soil-testing lab. The PSNT test takes into account mineralizable N, which has had time to convert from organic N to plant-available forms (ammonium (NH_4-N) and nitrate (NO_3-N)) with warmer spring and early summer soil temperatures. In-season N fertilization rates can be determined by applying the PSNT results to table 2 in *Nutrient Management Guidelines for Russet Burbank Potatoes*.

Plant-available N concentrations in the soil can increase dramatically from May to early June when there is a significant pool of mineralizable N in the soil (figure 1). This N can be used to boost crop yields and suggests a reduced need for additional N sources. Due to this pool of mineralizable N, potato plants in this specific field did not respond to in-season applications of organic N fertilizer. The plant-available N concentration decreased in late June and early July due to N uptake by the growing potato plants. Soil N samples taken at or after row closure will produce obsolete values for estimating plant available N.

It is also recommended that organic growers monitor soil P levels on a yearly basis to determine if this nutrient is accumulating to environmentally detrimental levels. Frequent applications of dairy compost and other organic nutrient sources can build up P to levels that degrade neighboring waterways. The USDA-NRCS Code 590 statute lists thresholds for soil test P on all soils (both conventional and organic) that receive field applications of manures and composts. For more information, go to: http://www.extension.uidaho.edu/nutrient/nutrient_management_planning/PDF/Code590.pdf

Yield goals

Yield goals (also known as "potential yield") for organically grown potatoes are likely to be considerably lower than for conventionally grown potatoes in the same vicinity. Average yield goals tend to be lower for organic potatoes than conventional potatoes due to stresses in an organic environment that are uncommon in conventional operations (nutrient deficiency, weed pressure, Colorado potato beetle infestations, etc.). For example, a common yield goal for an organic potato grower in the Snake River Plain region of Idaho would be between 300 and 350 cwt/acre, while a

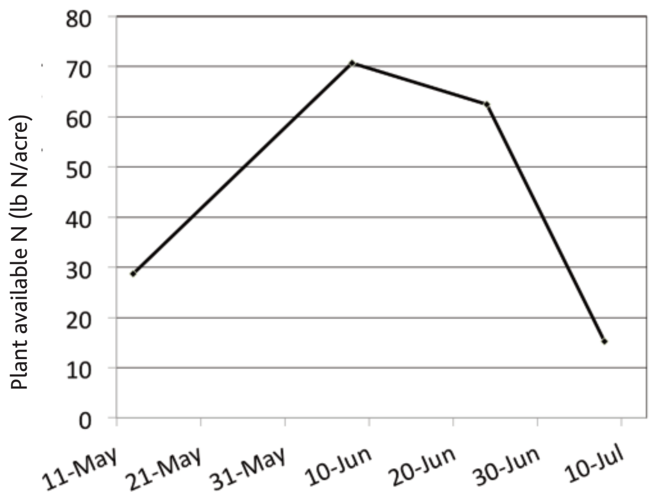

Figure 1. Plant-available soil N (ammonium and nitrate) in an organic potato field in Kimberly, Idaho, 2010. Source: Moore et al. 2011.

conventional potato grower would be more likely to use a yield goal between 450 and 550 cwt/acre.

Petiole nitrate

Testing the petiole of the fourth leaf from the top of the potato plant for nitrate concentrations is commonly used to monitor the N status of the plant (*Nutrient Management Guidelines for Russet Burbank Potatoes*). Conventional potato growers often sample petioles weekly, watching petiole N levels fall during tuber bulking and increase with in-season applications of N. *Nutrient Management Guidelines for Russet Burbank Potatoes* recommends conventional potato growers apply N to maintain petiole nitrate levels above 15,000 ppm during tuber bulking to meet the high N demands of the plant during this critical growth period.

However, it may not be appropriate for organic growers to aim for the same petiole nitrate standards as their conventional counterparts. Petiole nitrate goals were established by monitoring nitrate levels for plants that were fertilized with conventional N fertilizers that contain 90–100% available N. Petiole nitrate goals have not been established for organically produced potatoes, which typically have significantly lower amounts of plant-available N than conventionally produced potatoes.

Recent research suggests that petiole nitrate levels are much lower for organic than conventional potatoes. In a 2-year study conducted at the University of Idaho Kimberly Research and Extension Center, petiole nitrate levels were between 2,000 and 5,000 ppm during tuber bulking in a certified organic potato field, far lower than the 15,000 ppm recommended for conventional potatoes (Moore et al., 2011). However, these plants still yielded between 350 and 380 cwt/acre, which is an acceptable yield for organic potatoes in this region.

Organic potato growers are encouraged to monitor petiole N throughout the season to determine N status of the crop, but it is not recommended that organic growers use the petiole N recommendations listed in *Nutrient Management Guidelines for Russet Burbank Potatoes*. Due to the lack of research on this topic, specific petiole nitrate recommendations for organic potatoes cannot be provided at this time. Instead, we suggest the organic potato growers rely heavily on preplant and PSNT soil tests when determining both preplant and in-season nutrient rates.

Petiole P, K, and micronutrients

In addition to nitrate, potato growers commonly test petioles for additional nutrients (P, K, iron, etc.) to determine if in-season applications of these nutrients are needed. In general, petiole analysis for P, K, and micronutrients for organic potatoes is discouraged. The primary reasons for this are (1) effective organic in-season sources of P and K are scarce, and (2) P and K deficiencies are difficult, and often impossible, to correct once plant tissue reaches P- and K-deficient levels. P, K, and micronutrient deficiencies can be generally avoided in organic production systems through routine compost or manure applications and annual soil testing.

ORGANIC FERTILIZER SOURCES

In general, nutrient sources that are certified organic tend to have lower nutrient contents than conventional fertilizers. For this reason, organic growers often apply nutrient sources in units of tons per acre instead of pounds per acre to meet the nutrient requirements of their potato crop. In this publication, information on nutrient values for a variety of nutrient sources that are available to Idaho organic growers have been included (tables 2–5). Please keep in mind that the values are intended to be used only as a reference, as these values can vary by 100-fold or more, especially for manures, composts, and plant materials.

Because organic certification rules are constantly changing, we cannot guarantee that all of the nutrient sources listed are certified organic. To determine if a material is currently certified organic, please contact your local USDA organic certifier. Idaho organic potato growers can also refer to the Washington State Department of Agriculture Organic

Table 2. Typical nutrient composition of plant- and animal-based nutrient sources available to Idaho organic potato growers (percent as-is on a wet basis).

Nutrient source	N	P_2O_5	K_2O	Ca	Mg	S
Alfalfa meal	3	1	2.4	1.2	0.2	0.3
Bat guano	10	3	1			
Blood meal	12–15	3	0.8	0.3		
Bone meal	4.0	22	0	22	0.6	0.2
Canola meal	5.1	2	1.2	0.5	0.3	0.5
Corn gluten meal	9	0	0			
Corn stalks	0.7	0.5	0.9			
Cottonseed meal	6.5	2.5	1.5	0.4	0.9	0.2
Dried coffee grounds	2	36	0.7			
Dried distillers grain	3.8	1.3	0.9	0.2	0.2	0.3
Dried seaweed	0.7	0.8	5.0			
Enzymatically digested hydrolyzed liquid fish	4	2	2			
Feather meal	7-12	0	0			
Fish emulsion	5	2	2			
Fish meal	5–10	3–6	0	6	0.3	0.2
Fish powder	12	0.25	1			
Grass residues	1.5	0.5	1.9	0.8	0.2	0.2
Legume residues	3	1	2.4	1.2	0.2	0.3
Mustard meal	5.1	1.8	1.0	0.4	0.3	1.0
Peat	2.7			0.7	0.3	1.0
Pine needles	0.5	0.1				
Potato culls	0.4	0.2	0.5			
Potato leaves and stalks		0.6	0.2	0.4		
Shrimp meal	3–8	4–10	0			
Small grain residues	0.7	0.3	1.5			
Soybean meal	7	1.2	1.5	0.4	0.3	0.2
Sugar beet leaves and stalks	2.4					
Sugar beets	0.4					
Tankage	7	1.5	3–10			
Wood ash	0	0.6	10	10	0.7	

Note: Multiply by 20 to convert from percent (as-is) to lb nutrient per ton nutrient source. Listed nutrient values are only estimates. Using these values can result in either overfertilization or underfertilization. To determine the quantity of nutrients in a specific organic source, refer to the fertilizer label or send a sample to a qualified testing laboratory.

Table 3. Typical nutrient composition of mineral-based nutrient sources available to Idaho organic potato growers (percent as-is on a wet basis).

Nutrient source	N	P_2O_5	K_2O	Ca	Mg	S
Elemental Sulfur	0	0	0	0	0	52–100
Epsom salts (magnesium sulfate)	0	0	0	2	10	14
Greensand	0	1–2	5			
Gypsum (calcium sulfate)	0	0	0	22	0	17
Muriate of potash	0	0	60–62	0.1	0.1	
Potassium sulfate	0	0	50			
Rock phosphate	0	2–35	0			
Sodium nitrate	16	0	0.2	0.1		

Note: Multiply by 20 to convert from percent (as-is) to lb/ton. Listed nutrient values are only estimates. Using these values can result in either overfertilization or underfertilization. To determine the quantity of nutrients in a specific organic source, refer to your fertilizer label or send a sample to a qualified testing laboratory.

Table 4. Typical nutrient concentration of animal manures and other sources available to Idaho organic potato growers.

Manure/Compost	Unit (as-is)	N	P_2O_5	K_2O	Ca	Mg	S
Dairy manure, stockpiled	lb/ton	6–10	3–5	5–8	4–8	2	1
Dairy compost	lb/ton	7–18	8–20	2–45	4–30	8–13	3–5
Beef manure, stockpiled	lb/ton	12	7	9	5	2	2
Poultry litter, house	lb/ton	72	78	46	41	8	15
Poultry litter, stockpiled	lb/ton	36	80	34	54	8	12
Swine manure	lb/ton	13	12	9	12	2	2
Horse manure	lb/ton	12	6	12	11	2	2
Goat manure	lb/ton	22	12	18			
Rabbit manure	lb/ton	15–24	10–23	13	19	4	2
Sheep manure	lb/ton	14	11	19	24	7	6
Sweet whey	lb/acre-inch	26–53	13–26	40–75			
Acid whey	lb/acre-inch	26–53	80–110	40–75			

Note: Divide by 20 to convert from lb/ton to percent (as-is). Listed nutrient values are only estimates. Using these values can result in either overfertilization or underfertilization. To determine the quantity of nutrients in a specific organic source, refer to your fertilizer label or send a sample to a qualified testing laboratory.

Table 5. Typical nutrient concentration (%) of micronutrient mineral sources available to Idaho organic potato growers.

Micronutrient source	Concentration
Copper sulfate	13–53 Cu
Cupric oxide	75 Cu
Iron sulfate	20 Fe
Manganese sulfate	24 Mn
Manganese oxide	62–70 Mn
Zinc sulfate	22–36 Zn
Zinc carbonate	52 Zn
Zinc oxide	78 Zn

Note: Multiply by 20 to convert from percent (as-is) to lb/ton. Listed nutrient values are only estimates. Using these values can result in either overfertilization or underfertilization. To determine the quantity of nutrients in a specific organic source, refer to your fertilizer label or send a sample to a qualified testing laboratory.

Food Program website (http://agr.wa.gov/foodanimal/organic/) and the Organic Materials Review Institute website (http://www.omri.org/) for the most current lists of approved organic fertilizer amendments.

Dairy composts and dairy manure

With a standing herd of 581,000 dairy cows in 2012, Idaho has in dairy manure a readily available nutrient source for many Idaho growers. Composted manure is currently preferred by organic potato growers over fresh manure, based on the idea that composted manure causes fewer diseases, has lower *E. coli* risks, and contains less weed seed than fresh dairy manure. Mature compost can also be spread more uniformly than fresh manure, which has a tendency to form large, heterogeneous clumps in the soil.

Fresh and composted dairy manures are rich in phosphorus, potassium, and a wide variety of micronutrients. Composts and manures have more plant-available phosphorus than other organic sources such as rock phosphate, which is virtually insoluble in alkaline soils. However, it should be noted that on a short-term basis, composted manure is not an effective stand-alone nitrogen source for potatoes. During the composting process, ammonium and rapidly decomposable organic nitrogen compounds are converted to ammonia gas by microbes. Composting leaves a material that typically contains 1% nitrogen or less in stable forms of N, which will likely not be available to plants in the first growing season.

Certified organic compost may be applied to potatoes at any time during the growing season. For compost to be certified as organic, the compost must have an initial carbon to nitrogen (C:N) ratio between 25:1 and 40:1 and must have been maintained at a temperature of 131° to 170°F for 3 or 15 days, depending on the composting system. Also, manure used in certified organic compost does not have to come from certified organic livestock.

In contrast to the application timing of compost, fresh manures from organic and nonorganic animal production must be applied to root vegetable crops a minimum of 120 days prior to harvest. Fresh dairy manure has a higher total N content than composted manure. Manure N typically ranges from 1% to 3% total N and from 0% to 30% plant-available N in the first growing season.

If fresh manure is applied in the fall, nutrient availability will be greater for the following potato crop in comparison to spring applications. Fall applications may also reduce the risk of pathogen survival in the soil. Manure can also be applied to a preceding non-root-vegetable crop, as organic nitrogen will continue to be released into the following growing season.

Before using fresh manures, growers should confirm that they are selling to U.S. markets, as there are several countries that do not consider the application of fresh manures to be an organic crop production practice.

Sodium nitrate

Sodium nitrate (also referred to as Chilean nitrate or nitrate of soda) originates from a mineral source, and is therefore approved for application to organic crops. As with fresh manure, however, some overseas markets may not accept potatoes that are fertilized with sodium nitrate.

At 12% N, the nitrogen in sodium nitrate is immediately plant available, as it contains no organic N compounds that have to be mineralized by microbes. Growers must understand, however, that no more than 20% of the total N applied to the crop in a growing season may originate from sodium nitrate fertilizers. Growers using sodium nitrate should closely monitor sodium concentrations, electrical conductivity (EC_w), and the sodium adsorption ratio (SAR) of their soils to avoid sealing of soil surfaces, reducing water availability, and developing sodium toxicity issues.

Research conducted by the University of Idaho at Kimberly, Idaho, showed an increase in yield of 72 cwt/acre (27% yield increase) when sodium nitrate was applied at a rate of 48 lb N/acre during a transition from conventional to organic production (all plots received a one-time compost application during the previous fall) in comparison to control plots that were not amended with an N source (Moore et al., 2011). When the field had been certified organic for 1 year (and received 2 years of fall compost), there was no yield response to applications of Chilean nitrate.

Other N fertilizer sources

Organic potato growers have several other N source options available to them beyond sodium nitrate. According to Sullivan et al.(2010) and research from USDA ARS at Prosser, Washington, (Moore et al., 2010) and from the University of Idaho (Moore et al., 2011), plant-available nitrogen (PAN) can range from 40% to 60% in the same growing season for N sources with 3.5% N or greater. These materials have much more plant-available N than materials like dairy compost (0.5–1.5% N), which have 0–10% PAN in the first growing season. Examples of these higher-N options include soybean meal, canola meal, mustard meal, and organic materials with more than 4.0% N (tables 2 and 4).

Research conducted by the University of Idaho at Kimberly, Idaho, (Moore et al., 2011), showed an increase in yield of 111 cwt/acre (43%) with a 1.1 ton/acre application of dried distillers grains (4.3% N) during a transition from conventional to organic production (all plots received a one-time compost application during the previous fall). The following year, when the field had been certified organic for 1 year (and received 2 years of fall compost), the yield difference was not significant. While materials like dried distillers grains may no longer be approved as certified organic, we anticipate that meals and other materials with similar or higher N concentrations will cause similar yield increases.

COVER CROPS

A wide variety of cover crops are commonly included in organic cropping systems. Cover crops are selected by growers to serve specific purposes, which include soil building, N fertilization, weed suppression, and wind erosion prevention. We will explain these in more detail, focusing on how cover crops can directly benefit an organic potato production system.

Alfalfa for soil building and N

Rotating potatoes with perennial leguminous forage crops, such as alfalfa, is a widely accepted practice used by Idaho organic potato growers for building nitrogen reserves in the soil. Nitrogen-fixing rhizobia bacteria in legume root nodules convert dinitrogen (N_2) gas from the atmosphere into ammonium that can be used by the plant (figure 2). It has been estimated that an alfalfa stand in combination with the soil organic matter can contribute between 155 and 240 lb N/acre (Westermann and Crothers, 1993).

Many organic growers in the Magic Valley have had success maintaining at least 50% of their cropland area in alfalfa for a minimum of 3 years in order to build nitrogen reserves as well as improve soil structure and organic matter content. Growers who are transitioning a field from conventional to organic production are required to follow organic regulations for 3 years before the field can be

Figure 2. Pink coloring in dissected legume root nodules of hairy vetch at Aberdeen, Idaho, indicates an active population of N-fixing rhizobia bacteria.

certified as organic. The most common crop grown in Idaho during this transition period is alfalfa hay.

Winter annual legumes for N

Organic growers in southern Idaho have shown increased interest in utilizing N from plowdown (or incorporation) of cover crops such as Austrian winter peas, red clover, and hairy vetch (figure 3). These specific legumes are of interest to growers as green manure crops in Idaho due to their ability to effectively fix N, their winter hardiness, and the high N content of their plant tissue.

Annual legumes such as Austrian winter peas have shown promise as both an N source and as a means to increase potato tuber yields. Westermann and Stark (1993) found that soil test nitrate levels were at 219 lb N/acre after the plowdown of irrigated Austrian peas grown in Aberdeen, Idaho. Tuber yields increased for the following potato crop by up to 36 cwt/acre (table 6). Also, Reeves et al. (2009) estimated 91.9 lb N/acre in Austrian pea biomass grown under dryland conditions in Moscow, Idaho.

It should be mentioned that growing winter leguminous cover crops can be challenging in southern Idaho, due to the short window of time between fall harvest, freezing temperatures, and spring planting. As potatoes are typically planted from March to May, there is relatively little time for a significant amount of biomass to grow in early spring prior to planting. Some growers deal with this by opting for later planting dates, based on the idea that the amount of N gained from the increased cover crop biomass will compensate for plant growth lost by planting later.

Also, temperatures can dip low enough over the winter months to cause winterkill of even winter-hardy legumes. These legumes can often be spring planted and can even be grown for several years as perennial crops. This could be a viable option for a grower who could afford to take a field out of production for a growing season.

Winter brassicas for pest suppression and N

Brassica plant species, including mustard, radish, and turnips, are often grown as a means to help control a variety of pests, including weeds, insects, diseases, and nematodes (figure 4). Brassicas can be either fall or spring planted, although they rarely survive over the winter months. Some Idaho conventional potato growers include mustards in their potato rotations, believing that the pest-suppression and soil-building properties of the crop significantly improve potato yields. Research is

Table 6. Tuber yields (cwt/acre) for conventionally grown potatoes in Aberdeen, Idaho, as affected by management of various leguminous cover crops (Adpated from Westermann and Stark 1993).

Preceding crop	Treatment	Tuber yield
Wheat	Tilled under	402
Alfalfa	Harvested for hay	470
Alfalfa	Tilled under	511
Austrian peas	Harvested for seed	455
Austrian peas	Tilled under	491
Pea-Oat	Harvested for hay	462
Pea-Oat	Tilled under	497

Figure 3. Austrian peas (top) and hairy vetch (bottom) are sometimes grown as winter cover crops in southern Idaho. Photos taken in mid-spring, Nampa, Idaho.

Figure 4. Mustard residue left over in early spring from winterkill, Aberdeen, Idaho. Note the lack of weeds growing on this plot.

needed to better understand how crop rotations with brassicas impact potato growth.

Small grains for wind erosion prevention

Small grains (oats, barley, wheat, triticale, rye) are often grown during winter months in an organic cropping system to prevent wind erosion. The plant roots act as an anchor, holding the soil in place. Planting cover crops can be one of the easiest methods for preventing erosion losses in soils that are prone to wind erosion. To add the benefit of N, growers commonly fall plant a blend of annual legumes and small grains (figure 5).

Predicting N value of cover crops

When relying on cover crops as an N source, growers often search for simple tools to help them to predict how much N they can expect to be released from the plowed-under plant material. One useful tool currently available to growers is the OSU Organic Fertilizer and Cover Crop Calculator available at smallfarms.oregonstate.edu/calculator/. The calculator was created to allow Oregon growers to quickly and easily predict N availability from green manure crops based on tissue N content, total biomass, and dry matter content. While a similar cover crop calculator is currently being developed for Idaho conditions, the Oregon calculator may be used to provide a rough estimate of how much N will be released from a cover crop that has been plowed under. The Idaho cover crop calculator will be completed and available online starting in September 2013.

Figure 5. Austrian pea and winter wheat blend in early spring, Shoshone, Idaho.

FURTHER READING

Websites

ATTRA – National Sustainable Agriculture Information Service, Organic Farming
https://attra.ncat.org/organic.html

Compost testing labs
http://compostingcouncil.org/compost-analysis-proficiency-program/

Idaho State Department of Agriculture, Organic Certification
http://www.agri.idaho.gov/Categories/PlantsInsects/Organic/indexOrganicHome.php

Manure testing labs
http://www2.mda.state.mn.us/webapp/lis/manurelabs.jsp

Organic Materials Review Institute
http://www.omri.org/

Rodale Institute
http://www.rodaleinstitute.org/

Soil testing labs (North American Proficiency Testing Program)
http://www.naptprogram.org/pap/labs

United States Department of Agriculture National Organic Program
http://www.ams.usda.gov/AMSv1.0/nop

University of Idaho nutrient management website, potato
http://www.extension.uidaho.edu/nutrient/crop_nutrient/potato.html

Washington State Department of Agriculture Organic Food Program
http://agr.wa.gov/foodanimal/organic/

Publications

Nutrient Management Guidelines for Russet Burbank Potatoes (University of Idaho Extension bulletin 840)
http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0840.pdf

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