TECHNICAL NOTES

U.S. Department of Agriculture Natural Resources Conservation Service

WA: Agronomy Technical Note 17 **Spokane, Washington**

A Planner's Guide to Nutrient Management

Introduction:

Nutrient management plans are written to be site-specific instructions for how the primary plant nutrients (nitrogen, phosphorus, and potassium) will be managed annually for agronomic crop production and protection while also minimizing potential nutrient losses to the environment. There are four primary nutrient management principles to consider when managing nutrients; right rate, right source, right placement and right timing of plant nutrients and soil amendments.

Manure and organic by-products are a good source of organic matter and plant nutrients but can pose challenges when learning how to manage nutrients. Manure and organic by-products are highly variable in nutrient content and availability to crops. Application methods often bring more variability because of the difficultly in applying the fertilizers in a uniform manner. Fresh manure and un-composted or untreated organic by-products also have the added risk of pathogen contaminates that can cause disease in humans.

Purpose:

This technical note provides guidance for the application of all nutrients, as well as, manure and organic by-products during critical weather periods of Washington that will minimize the risk of contaminates moving to surface and/or groundwater. All nutrient applications must meet the criteria set forth in the Washington 590 Nutrient Management standard, FOTG IV and in National Policy found in General Manual 190, Part 404. This document will not supersede or provide any exemptions to the NRCS WA 590 standard. This document will:

- Define the use of nutrient budget factors to determine practical rates required for crop production.
- Define risk assessment procedures.
- Define limitations based on the risk assessments, as well as, site characteristics and soil conditions when no application of nutrients should be considered.
- Identify Sensitive Areas.
- Provide conservation practices and additional mitigation techniques to aid in prevention of excess nutrients entering surface and ground water.
- Steps to developing an official Nutrient Management Plan.

Nutrient Budget

Development of a nutrient budget entails determining a crop's need for Nitrogen (N), Phosphorus (P), Potassium (K) and other nutrients as appropriate. The target nutrient application rate can be deter-

mined using the difference between the crop nutrient needs and any nutrient credits from the system. When the credits are less than the crop needs, supplemental nutrients should be supplied to achieve yield goals. A balanced nutrient management system supplies the required nutrients while minimizing any excess nutrients that may contribute to soil buildup or losses to the environment.

When calculating the appropriate rate of manure or organic by-product the initial test will be a laboratory analysis based on a sample taken within 60 days of the first winter period application. Additional testing of manure or organics may be used to fine tune application rates throughout the year. Nitrogen meters, hydrometer tests and laboratory analysis are acceptable methods. A common schedule is three samples per year collected during early fall, early spring and midsummer. Manure and organic by -product analysis will include measures of organic nitrogen, ammonia (NH4) and nitrates (NO3) to estimate Plant Available Nitrogen (PAN).

Nutrient applications based on budget must also coordinate with timing of plant growth and uptake. Applications should be made as closely timed to nutrient uptake as possible taking into consideration mineralization rates of nitrogen and phosphorus in the manure and organic by-products.

It must also include a current representative soil sample analysis for N, P, K, acidity (pH), organic matter (OM), and electrical conductivity (EC) collected according to the planned sampling schedule. The nutrient budget for each field or crop management unit (CMU) must include realistic yield goals and associated nutrient recommendations or crop removal rates for N, P and K. Nutrient removal rates, if utilized in the budget, will be based on estimated values contained in Chapter 6, Ag Waste Management Field Handbook (AWMFH) and the USDA-NRCS Plants Database, Crop Nutrient Tool.

All significant sources of nutrients in the system must be credited to the nutrient budget. Nutrient credits including nitrogen mineralization of soil organic matter, residual nitrogen from long-term manure or organic by-product applications, nitrogen supplied from irrigation water, nitrogen available from previous legume crops or cover crops and when appropriate any soil test nitrogen will be included when completing the nutrient budget.

Risk Assessment

Soils within a field should be evaluated and a site investigation performed, if needed, to confirm soil map unit designations and associated properties. It is critical to properly identify the soil type and properties to understand water and nutrient interaction with the soil. Other risk assessments also rely on accurate soils information to give accurate prediction of risk for nutrient movement

Nitrogen and phosphorus are essential for production of crops. However, if excess of these nutrients exists in the soil under certain conditions, they may be subject to movement into the adjacent surfaces and/or ground water via runoff, soil erosion, or leaching. Movement of nutrients can be minimized by following a good nutrient budget and by applying manures and organic by-products based on the following risk assessment tools and factors:

- Maintain current soil samples within the last three years for phosphorus. An annual fall soil nitrate test should be performed and the results analyzed. Pre-plant or pre-side-dress soil nitrate test when applicable.
- Complete soil erosion predictions using current erosion prediction technology (ex. RUSLE2, WEPS).

- Complete a current phosphorus index evaluation.
- Complete a Soil Nitrate Leaching Potential analysis evaluation from Soil Data Mart.
- Obtain current information and any historic field conditions should be gathered for soil moisture, depth to water table, frequency of ponding and flooding, frozen or snow covered ground.
- Obtain knowledge of local climate trends, seasonal weather patterns and current forecasting reports.
- Tile drains identified if present and locations documented.

Limitations Based on Risk Assessments

Fertilizer, manure and organic by-product applications should be made to fields with the least potential for risk of nutrient movement offsite (not to exceed agronomic rates for N or P). Limitations should be based on risk assessments, analysis of field physical characteristics, climatic information, and on-site and operation characteristics. When planning the timing of applications it is important to first identify fields with the lowest risk followed by medium and only then plan to apply to higher risk fields. Often times emphasis is put only on the current climatic issues. Less mitigation for offsite movement is usually needed when applications are first prioritized to lower risk areas and then current conditions.

The following limitations should be considered for no application of manures or organic by-products:

- Field areas have a phosphorus index in the high risk category (see WQ Tech Note 2)
- Soils are frozen, ponded or saturated on the day of application or those conditions are projected for days immediately following application
- Flooding or ponding is expected to occur during or immediately following application within the current forecast window
- Greater than 0.5 inches of rain have occurred in the last 2 days and not more than 0.25 inches is forecasted in any one event for the day or 2 days following application.
- Soil has reached water holding capacity

Some limitations should be considered high risk and considered for no application unless proper timing is used to avoid critical weather events and mitigation techniques are put in place to prevent any potential nutrient and/or pathogen runoff or nutrient leaching. These limitations include:

- Nitrogen leaching potential with high risk values.
- Application areas with slopes greater than 8%.
- Fields with soil loss prediction greater than soil loss tolerance of "T".
- Tile drains present.

Surface application of manure or organic by-products on saturated, frozen, and snow covered soils should only be considered under emergency situations. If any nutrient application must be done on saturated, frozen, or snow covered soils, consider the following:

- Solid manure and organic by-products present a lower runoff risk than liquid manure or organic by-products.
- The application rate per acre should be low (10 wet tons per acre or 1/2 the agronomic rate whichever is

less for solid manure, with more than 50% solids; 5 wet tons/ac manure <50% solids or 1/2 the agronomic rate; and 5000 gal/ac for liquid manure or 1/2 the agronomic rate whichever is less).

- Only apply on slopes <4%.
- Do not apply within 100 feet of concentrated flow or within 100 feet of where runoff may enter a stream, ditch, or other watercourse.
  - Vegetated buffers and filter strips can help minimize the risk nutrient and pathogen runoff within the 100 foot setback from concentrated flow.
  - Berms or even a plowed furrow can further divert runoff from concentrated flow areas.
- Do not apply on floodplains (land subject to flooding)
- Limit application area (10-20 acres is better than 20-40 acres)

Additional Sensitive Areas

Sensitive areas may not always be identified in the assessment tools but are just as essential and need to be identified. Sensitive areas may include, but are not limited to, areas such as; residences, lakes and protected watersheds, perennial and intermittent streams, drainage ditches, road ditches, open tile intakes, and well and wellhead protection areas. Make sure to follow local and state regulations for setbacks or vegetated buffers as applicable in any or all of the identified areas. Use mitigation techniques to minimize any potential nutrient movement to the identified sensitive areas.

Conservation Practices and Mitigation Techniques

The tables in Appendix B provide a list of conservation practices and mitigation techniques to consider for implementation in a nutrient management system. These lists are not all-inclusive but identifies many options to consider when analyzing nitrogen and phosphorus loss to ground and surface waters. Not all practices or techniques are suitable in every situation and individual site conditions need to be taken into consideration to determine the effect of a chosen practice or technique.

Documenting a Nutrient Management Plan

1. Identify current cropping system rotation and determine if yield goals are realistic. Document past cropping history, past nutrient management practices, available equipment and a plan map. The plan map should clearly identify fields that are included in the nutrient management plan, sensitive and limiting areas, and any conservation practices or mitigation techniques identifiable on a map. Farm specific economic, social and environmental goals should be identified, documented, and incorporated into the nutrient management planning.

2. Limitations and Sensitive areas.

   A. Document the identified limitations from the risk assessments. Identify sensitive areas and the associated effects these have in relation to the nutrient management plan.

   B. Select conservation practices and mitigation techniques to address the identified limitations and sensitive areas.

3. Document the nutrient management plan including the four nutrient management principles (right source,

right rate, right time, right place). These principles will incorporate the current cropping system's identified goals, additional conservation practices and mitigation techniques identified in step two.

A. Right Source: Balancing the primary nutrients while considering both naturally available sources and characteristics of specific products in plant available forms. Nutrient sources utilized must be compatible with the application timing, tillage and planting system, soil properties, crop rotation, soil organic content and local climate to minimize risk to the environment. Proper analysis of source is crucial to determine available N, P, K.

B. Right Rate: Assess soil nutrient supply and plant demand to choose an appropriate rate. A nutrient budget should be attached based on LGU recommendations (attachment A), crop, current soil test results, realistic yield goals, and nutrient assessment results. All potential sources of nutrients include but are not limited to green manures, legumes, crop residues, compost, animal manure, organic by products, bio solids, waste water, organic matter, soil biological activity, commercial and organic fertilizer and irrigation water. Nutrient availability and yield response can also be impacted by pH, salinity, etc. and should also be considered.

C. Right Time: Include decisions based on crop uptake, soil supply, nutrient loss risks and field operation logistics. Some considerations should include nutrient source , soil properties, weather conditions, drainage system, soil biology and nutrient risk assessment results.

D. Right Place: This should be managed to meet site-specific crop needs and limit any potential nutrient losses while addressing variability within the field. Some considerations may include incorporations, avoiding unnecessary applications to non-crop areas, carefully managing drainage and tile drained fields and root-soil dynamics.

4. Evaluate the effectiveness of the plan with good monitoring throughout the crop year and after every crop harvest. Calculate nutrient use efficiency after every harvest. Document and consider crop health, vigor and yield, any notable changes in operations or weather that should be taken into account. Be aware of any trends in soil organic matter, soil productivity, local water and/or air quality. If necessary reevaluate assessment tools to ensure conservation practices and mitigation techniques and the four nutrient principles (right; source, rate, time, place). Continue to address goals, limitations and sensitive areas. Adjust future nutrient management based on these evaluations. While all of these cannot singly measure the success of your nutrient management plan, continued improvements and sound management of all practices will improve the effectiveness of future nutrient management.

References

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WQ-Technical 3. 2013. Nitrogen Leaching Potential, USDA-NRCS Washington State. eFOTG; Section II. http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=WA

RUSLE2, 2005. Revised Universal Soil Loss Equation Version 2. USDA-NRCS, Washington, DC. http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm

WEPS, 2010. Wind Erosion Equation. USDA-NRCS, Washington, DC. http://www.weru.ksu.edu/nrcs/

Soil Data Mart. http://www.soildatamart.nrcs.usda.gov/

		Nutrient concern targeted		
NRCS Conservation Practice	**Purpose**	**N: Leaching**	**P & N: Soil and Water run-off**	**P: Dissolved P**
Nutrient Management	Nutrient planning should follow current nutrient management standards for appropriate rate, application method, source, and timing of all nutrients, not just manures.	YES	YES	YES
Vegetated Buffer, Contour Buffer Strip, Filter Strip, Terrace.	Catch or filter sediments and nutrients		YES	YES
Cover Crops	Prevents wind/water erosion and captures nutrients in the soil system between crops.	YES	YES	YES
Crop Rotation	Uses intermediate crops to take up residual nutrient and provide erosion protection. Double cropping to maximize nutrient uptake and removal.	YES	YES	YES
Residue management, No-Till and Minimum Tillage	Reduce wind/water erosion and build soil structure that will increase infiltration and decrease surface runoff.		YES	
Strip Cropping	Reduce wind/water erosion.		YES	
Contour Farming	Reduce wind/water erosion.		YES	
Surface Roughening	Reduce runoff and soil loss.		YES	YES
Waste Storage Facility	Increase storage capacity to avoid spreading during critical runoff periods. Covered facilities can reduce rainwater accumulation in manure storage for better and more precise manure management and application.	YES	YES	YES
Feed Management	Manipulate animal feed rations to reduce nutrients in manure output.	YES	YES	YES
Irrigation Water Management	Irrigation water should be closely monitored to reduce leaching of nutrients through the soil profile, and to prevent runoff and irrigation induced soil erosion. Establish tail water recovery system.	YES	YES	YES
Solid/Liquid Waste Separation Facility	Increase separation to remove solids from nutrient rich liquids for better manure application management.	YES	YES	YES
Roof Runoff Structure	Reduce rainwater accumulation from roof runoff to better manage manure product for application.	YES	YES	YES
Sediment Basins	Control the contaminants in sandy soils.		YES	YES
Diversion	Channel contaminated runoff into lagoons, waste storage ponds or settling basins.		YES	YES
Grazing Management	Do not graze heavily fertilized fields so nutrients not utilized in the digestion process will not contribute to field already heavy in nutrients.	YES	YES	YES

		Nutrient concern targeted		
Mitigation techniques to reduce manure and organic by-product inputs to fields	**Purpose**	**N: Leaching**	**P & N: Soil and Water run-off**	**P: Dissolved P**
Export manure	Offsite application of manure and organic by-products will help to stop nutrient buildup on fields.	YES	YES	YES
Export selective manure sources	Export pit manures and thick manures with the highest concentrated nutrients.	YES	YES	YES
Reduce number of animals	Reduction of on-farm animals results in total reduction amount of manure and nutrients to manage.	YES	YES	YES
Increase cropping acres	Allows for more acres to apply manures and organic by-products at recommended nutrient application rates.	YES	YES	YES
Mitigation techniques for redistribution of nutrients				
Remove excess straw or plant material from previous crops	Allows the redistribution of nutrients in plant material to low nutrient locations.	YES	YES	YES
Increase on farm livestock feed	Less farm imports reduces whole farm nutrient loading.	YES	YES	YES
Mitigation techniques for reducing nutrient loss from field				
Berm downslope edges of fields	Reduce offsite soil and nutrient surface movement.		YES	
Berm all field edges	Reduce offsite soil and nutrient surface movement. Eliminate movement of water, soil, and nutrients from offsite onto target field.		YES	
Setbacks	Maintain adequate setback from down gradient surface water, open tile line, intake structures, sinkholes, and agricultural well heads or other conduits to surface waters when applying nutrients. Increase distances when chance for precipitation runoff is high.		YES	
Injection/Incorporation	Inject or work into the soil within three days of application. If not injecting or incorporating, limit total manure application and be cautious of timing with precipitation events to avoid runoff.		YES	YES
Tile drains: management	Apply nutrients as close as possible to crop uptake and limit nutrient application on fields when tiles are running.	YES		YES
Tile drain filters	Install filters on tiles to catch nutrient rich sediment or to redirect tile waters to flow through a designed filter area before entering waterways.	YES	YES	YES
Compost	Compost to reduce the availability of nutrients.	YES	YES	YES
Constructed treatment wetlands	Use natural chemical, physical and biological processes to improve water quality.		YES	YES

Mitigation techniques to enhance nutrient management	**Better nutrient management will help to achieve appropriate rate, timing, source, and placement. This provides better conservation of ground and surface water quality.**
Plant tissue testing	In season plant tissue testing for appropriate applications to supplement based on plant needs.
Increase manure sampling frequency	Increase manure sampling frequency including additional testing during application will assist in better nutrient budgeting.
Water quality tests and data	Analysis of water quality tests and data can identify potential sources of loss of nutrients from field.
Calibration of equipment	Increase calibration frequency of application equipment to more accurately apply nutrients.
Manure source selection	Use second stage manure (lower solids and lower P levels) on high P fields. When irrigation application equipment is limited to high volume outflow, dilute manure with addition of irrigation water to reduce nutrient concentrations. Apply thick manure with the highest concentrations of nutrients at lower volumes early in the growing season, when plant uptake potential is high.
Climatic records	Use current weather forecasts, precipitation records, and irrigation scheduling to determine application timing, method, and amount.
Precision application equipment	Use of precision application equipment can allow for better nutrient management. Use split or multiple applications of nutrients to meet the current needs of the growing crop and reduce nutrient applications to match plant uptake in growth.
Nitrification inhibitors	Utilize nitrification inhibitors to prevent overwinter losses in draws and other water collection areas.
Use alternate nutrient sources	When nutrient budget required more N and less P and/or K, use legumes species to provide N or synthetic N fertilizers.
Inject or Incorporate	Limits the availability of particular constituents to bind nutrients to the soil and less availability for detachment.

NRCS WA State Approved Land Grant University Guidance Documents

Sorting	Crop	Name	Source	Bulletin #	Year	State
forage	Alfalfa	Organic Alfalfa Management Guide	http://store.msuextension.org/Products/Developing-Fertilizer-Recommendations-for-Agriculture__MT200703AG.aspx	EB-2039E	2009	WA
forage	Alfalfa	Nutrient Management Guide for Dryland and Irrigated Alfalfa in the Inland Northwest	http://cru.cahe.wsu.edu/cepublications/pnw0611/pnw0611.pdf	PNW-0611	2009	WA,OR,ID
forage	Alfalfa	Nutrient Management for dryland and irrigated Alfalfa in the inland Northwest	http://cru.cahe.wsu.edu/CEPublications/pnw0611/pnw0611.pdf	PNW-0611	2009	WA,OR,ID
forage	Alfalfa	Developing Fertilizer Recommendations for Agriculture	http://store.msuextension.org/Products/Developing-Fertilizer-Recommendations-for-Agriculture__MT200703AG.aspx	MT200703AG	2007	MT
forage	Alfalfa	Acidifying Soil for crop production: Inland Pacific Northwest	http://ir.library.oregonstate.edu/xmlui/handle/1957/20789	PNW-599-E	2007	WA, OR, ID
forage	Alfalfa	Southern Idaho fertilizer guide: Irrigated Alfalfa	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1102.pdf	CIS-1102	2002	ID
forage	Alfalfa	Fertilizer Guide: Alfalfa, Willamette Valley and Northwest Oregon	http://ir.library.oregonstate.edu/xmlui/handle/1957/20629	FG-18-e	2000	OR
forage	Alfalfa	Intermountain Planting Guide	http://extension.usu.edu/files/publications/publication/pub__7717229.pdf	AG-510	2000?	UT
forage	Alfalfa	Northern Idaho fertilizer guide: Alfalfa	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0447.pdf	CIS-447	2005	ID
forage	Bluegrass	Northern Idaho Fertilizer guide: Bluegrass seed	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0788.pdf	CIS-788	2006	ID
forage	Bluegrass	Kentucky bluegrass production	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0842.pdf	BUL-842	2005	ID
forage	Canarygrass, Reed	Fertilizer guidelines for Montana Crops	http://msuextension.org/publications/AgandNaturalResources/EB0161.pdf	EB-161	2005	MT
forage	Canarygrass, Reed	Intermountain Planting Guide	http://extension.usu.edu/files/publications/publication/pub__7717229.pdf	AG-510	2000?	UT
forage	Clover, crimson	Fertilizer Guide: Crimson Clover, Vetch, and Field Peas, Western ...	http://ir.library.oregonstate.edu/xmlui/handle/1957/20637?show=full	Fg-30-e	2000	OR
forage	clover, red	Fertilizer Guide: Red Clover, Western Oregon	http://extension.oregonstate.edu/catalog/details.php?search=red+clover+	fG-79	2000	OR
forage	Fescue, Tall	Intermountain Planting Guide	http://extension.usu.edu/files/publications/publication/pub__7717229.pdf	AG-510	2000?	UT
forage	Fescue, Tall	Tall Fescue	http://web.cals.uidaho.edu/idahogardens/2012/08/tall-fescue/	PNW-504	1999	WA,OR,ID
forage	Forage	Idaho Forage Handbook (third edition)	http://www.cals.uidaho.edu/edComm/detail.asp?IDnum=1274	BUL-547	2005	ID
forage	grass	Northern Idaho Fertilizer guide: Grass Pastures	http://www.cals.uidaho.edu/edComm/detail.asp?IDnum=246	CIS-853	2005	ID
forage	grass	Northern Idaho fertilizer guide: Grass seedings for conservation programs	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0820.pdf	CIS-820	2005	ID
forage	Grass, legume	Northern Idaho fertilizer guide: Legume and legume-grass pastures	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0851.pdf	CIS-851	2005	ID
forage	Grass, Legume	Fertilizer Management For Grass and Grass-Legume Mixtures	http://extension.usu.edu/files/publications/publication/AG-FG-_03.pdf	AG-FG-03	2002	UT
forage	Hay	Haymaking on the Westside	http://cru.cahe.wsu.edu/CEPublications/eb1897/eb1897.pdf	EB-1897	2001	WA, OR
forage	Meadows, Native	Fertilizer Guide: Native Meadows, Eastern Oregon	http://extension.oregonstate.edu/catalog/details.php?search=native+meadow	FG-22	2000	OR
forage	Pasture	Pasture and Grazing Management in the Pacific Northwest	http://www.cals.uidaho.edu/edComm/pdf/PNW/PNW0614.pdf	PNW-614	2010	WA,OR,ID
forage	Pasture	Southern Idaho Fertilizer guide: Irrigated Pastures	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0392.pdf	CIS-392	2009	ID
forage	Pasture	Managing Small-acreage Horse Farms for Green Pastures	http://smallfarms.oregonstate.edu/horses	EC-1558	2003	OR
forage	Pasture	Pastures Fertilizer Guide Wester Oregon and Western Washington	http://forages.oregonstate.edu/fi/topics/pasturesandgrazing/fertilizationandliming/pasturefertilizerguide	FG-63	2000	WA,OR,ID
forage	Trefoil, Birdsfoot	Birdsfoot Trefoil production in Northeastern Idaho	http://www.cals.uidaho.edu/edComm/detail.asp?IDnum=235	CIS-831	1988	ID
forage	Triticale	Double-Cropped winter forages	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0869.pdf	BUL-869	2009	ID
forage	Vetch	Fertilizer Guide: Crimson Clover, Vetch, and Field Peas, Western ...	http://ir.library.oregonstate.edu/xmlui/handle/1957/20637?show=full	Fg-30-e	2000	OR
forage	Wheatgrass	Intermountain Planting Guide	http://extension.usu.edu/files/publications/publication/pub__7717229.pdf	AG-510	2000?	UT
forage	Wheatgrass	Intermountain Planting Guide	http://extension.usu.edu/files/publications/publication/pub__7717229.pdf	AG-510	2000?	UT
forage	Wheatgrass	Intermountain Planting Guide	http://extension.usu.edu/files/publications/publication/pub__7717229.pdf	AG-510	2000?	UT
forage	Wheatgrass	Intermountain Planting Guide	http://extension.usu.edu/files/publications/publication/pub__7717229.pdf	AG-510	2000?	UT
fruit	Apples	Organic Apple Production Manual	http://anrcatalog.ucdavis.edu/SustainableandOrganic/3403.aspx	ANR publication 3403	2000	CA
fruit	Apples	Growing apples for local markets in cold climates	http://www.cals.uidaho.edu/edcomm/pdf/BUL/BUL0820.pdf	BUL-820	2000	ID
fruit	Apples	Apples Nutrient Management Guide	http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/20034/em8712-e.pdf	EM 8712	1998	OR

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fruit	Blackberries	Growing Raspberries and Blackberries in the Inland Northwest & Intermountain West	http://www.cals.uidaho.edu/edcomm/pdf/BUL/BUL0812.pdf	BUL-812	1999	ID
fruit	Blueberries	Nutrient management for Blueberries in Oregon	http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/20444/em8918.pdf	EM-8918	2006	OR
fruit	Blueberries	Northern Idaho Fertilizer guide Blueberries, Raspberries, and Strawberries	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0815.pdf	CIS-815	2000	ID
fruit	Caneberries	Caneberries fertilizer guide	http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/23822/FGNO051.pdf?sequence=1	FG-51	2000	OR
fruit	Cantaloupe	Cantaloupe production in California	http://anrcatalog.ucdavis.edu/pdf/7218.pdf	ANR Publication 7218	2008	CA
fruit	Cranberries	Cranberries Nutrient Management Guide	http://whatcom.wsu.edu/ag/documents/smallfruit/em8903-e.pdf	EM-8903	2006	WA
fruit	Currants	Growing Currants, Gooseberries & Jostaberries in the Inland Northwest & Intermtn West	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0855.pdf	BUL-855	2009	ID
fruit	Goose Berries	Growing Currants, Gooseberries & Jostaberries in the Inland Northwest & Intermtn West	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0855.pdf	BUL-855	2009	ID
fruit	Grapes	Sampling Guide for Nutrient Assessment of Irrigated Vineyards in the Inland Pacific NW	http://cru.cahe.wsu.edu/CEPublications/PNW622/PNW622.pdf	PNW-622	2011	WA,OR,ID
fruit	Grapes	Nutrient Management in Idaho Grape Production	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1171.pdf	CIS-1171	2009	ID
fruit	Hazelnuts	Hazelnuts Nutrient Management Guide	http://extension.oregonstate.edu/catalog/details.php?search=hazelnuts	EM-8786	2001	OR
fruit	Huckleberries	Growing Western Huckleberries	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0821.pdf	bul-821	1999	ID
fruit	Jostaberries	Growing Currants, Gooseberries & Jostaberries in the Inland Northwest & Intermtn West	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0855.pdf	BUL-855	2009	ID
fruit	Kiwifruit	Growing Kiwifruit	http://www.cals.uidaho.edu/edComm/detail.asp?IDnum=1571	PNW-507	2004	WA,OR,ID
fruit	Lingonberry	lingonberry production guide for the pacific northwest	http://ir.library.oregonstate.edu/xmlui/handle/1957/20774?show=full	pnw-583-e	2006	OR,WA,ID
fruit	melons	Fertilizer Guide: Vine Crops	http://horticulture.oregonstate.edu/content/vine-crops-cucumbers-melons-squash-pumpkins-fertilizer-guide-osu-extension-series-fg-68-e	FG-68	2000	OR
fruit	Peaches	peaches	http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/23823/FGNO053.pdf?sequence=1	fg-53	2000	OR
fruit	Pears	Pears Fertilizer guide	http://extension.oregonstate.edu/yamhill/pears	FG-59	1997	OR
fruit	Prunes	Growing Prunes	http://osuext.intermountaintech.org/download/Growing%20prunes.pdf	Extension Circular-773	1990	OR
fruit	Raspberries	Commercial Red Raspberry Production	http://www.cals.uidaho.edu/edComm/detail.asp?IDnum=1418	PNW-598	2007	WA,OR,ID
fruit	Raspberries	Northern Idaho Fertilizer guide Blueberries, Raspberries, and Strawberries	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0815.pdf	CIS-815	2000	ID
fruit	Raspberries	Growing Raspberries and Blackberries in the Inland Northwest & Intermountain West	http://www.cals.uidaho.edu/edComm/detail.asp?IDnum=151	BUL-812	1999	ID
fruit	Rhubarb	Rhubarb Production in California	http://anrcatalog.ucdavis.edu/pdf/8020.pdf	ANR Publication 8020	2000	CA
fruit	Saskatoons	Growing Saskatoons in the Inland Northwest and Intermountain West	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0866.pdf	BUL-866	2009	ID
fruit	Strawberries	Organic Strawberry Production Manual	http://anrcatalog.ucdavis.edu/OrganicProductionManuals/3531.aspx	ANR publication 3531	2012	CA
fruit	Strawberries	High tunnel strawberry production	http://extension.usu.edu/files/publications/publication/Horticulture_HighTunnels_2010-01pr.pdf	Horticulture/HighTunnels/2010-01pr	2010	UT
fruit	Strawberries	Northern Idaho Fertilizer guide Blueberries, Raspberries, and Strawberries	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0815.pdf	CIS-815	2000	ID
fruit	Strawberries	Strawberries fertilizer guide (Western Oregon - West of Cascades)	http://www.oregon-strawberries.org/attachments/strawberry_fertilizer_guide14-e.pdf	FG-14	2000	OR
fruit	Strawberries	Growing Strawberries in the Inland Northwest & Intermountain West	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0810.pdf	BUL-810	1999	ID
fruit	Vineyards	Sampling Guide for Nutrient Assessment of Irrigated Vineyards in the Pacific Northwest	http://cru.cahe.wsu.edu/CEPublications/PNW622/PNW622.pdf	PNW-622	2011	WA,OR,ID
fruit	Watermelon	Watermelon Production in California	http://anrcatalog.ucdavis.edu/pdf/7213.pdf	ANR Publication 7213	2009	CA
grain	Barley	Double-Cropped winter forages	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0869.pdf	BUL-869	2009	ID
grain	Barley	Northern Idaho fertilizer guide Spring Barley	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0920.pdf	CIS-920	2007	ID
grain	Barley	Northern Idaho Fertilizer guide Winter Barley	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0954.pdf	CIS-954	2007	ID
grain	Barley	Idaho Spring Barley Production Guide	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0742.pdf	BUL-742	2003	ID
grain	Barley	Pasture and Hayland Renovation for Western Washington and Oregon	http://cru.cahe.wsu.edu/CEPublications/eb1870/eb1870.pdf	EB-1870	2002	WA, OR
grain	Barley	Southern Idaho Fertilizer Guide Irrigated Winter barley	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1082.pdf	CIS-1082	2000	ID
grain	Bean	Southern Idaho Fertilizer guide Beans	http://cals.uidaho.edu/edcomm/pdf/cis/cis1189.pdf	CIS-1189	2012	ID

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grain	Bean	Common Dry Bean Production in California	http://anrcatalog.ucdavis.edu/pdf/8402.pdf	ANR Publication 8402	2010	CA
grain	Buckwheat	Fertilizer guidelines for Montana Crops	http://msuextension.org/publications/AgandNaturalResources/EB0161.pdf	EB-161	2005	MT
grain	Canola	Canola Nutrient Management	http://css.wsu.edu/biofuels/files/2012/09/Koenig_Canola_Nutrient_Management.pdf	FS-045E	2012	WA
grain	Canola	Nutrient Management Guide: Irrigated and Dryland Canola, EM ...	http://extension.oregonstate.edu/catalog/details.php?search=nutrien+management+guide+canola	EM-8943-E	2007	OR
grain	Canola	Northern Idaho Fertilizer guide: Spring Canola	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1012.pdf	CIS-1012	2005	ID
grain	Chickpea	Northern Idaho Fertilizer guide Chickpeas	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0826.pdf	CIS-826	2005	ID
grain	Corn	Sweet corn Nutrient Management guide (Western Oregon)	http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/19064/em9010.pdf	EM-9010-E	2010	OR
grain	Corn	Nutrient Management for Field Corn Silage and Grain	http://www.cals.uidaho.edu/edComm/pdf/PNW/PNW0615.pdf	PNW-615	2010	WA,OR,ID
grain	Corn	Silage Corn Nutrient Management Guide in Western Oregon	http://extension.oregonstate.edu/catalog/details.php?search=silage+corn+&submit.x=8&submit.y=10	EM-8978-E	2009	OR
grain	Corn	Double-Cropped winter forages	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0869.pdf	BUL-869	2009	ID
grain	Corn	Fertilizer Guide: Field Corn, Eastern Oregon	http://extension.oregonstate.edu/catalog/details.php?search=field+corn	Fg-71	2000	OR
grain	Corn	Fertilizer Guide: Sweet Corn, Eastern Oregon	http://extension.oregonstate.edu/catalog/details.php?search=sweet+corn	FG-62	2000	OR
grain	Corn	Baby Corn	http://cru.cahe.wsu.edu/CEPublications/PNW0532/PNW0532.pdf	PNW-0532	2000	WA,OR,ID
grain	Lentil	Northern Idaho Fertilizer guide Lentils	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1083.pdf	CIS-1083	2005	ID
grain	Lentil	Fertilizer guidelines for Montana Crops	http://msuextension.org/publications/AgandNaturalResources/EB0161.pdf	EB-161	2005	MT
grain	millet	Fertilizer guidelines for Montana Crops	http://msuextension.org/publications/AgandNaturalResources/EB0161.pdf	EB-161	2005	MT
grain	Oats	Northern Idaho Fertilizer guide Oats	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1135.pdf	CIS-1135	2007	ID
grain	Oats	Fertilizer guidelines for Montana Crops	http://msuextension.org/publications/AgandNaturalResources/EB0161.pdf	EB-161	2005	MT
grain	Pea, Dry	Dry Pea, Lentil and Chickpea Production in Northern Idaho	https://pubs.wsu.edu/ItemDetail.aspx?ProductID=14279&SeriesCode=&CategoryID=132&Keyword= (BAD LINK)	IDB-664	1991	ID
grain	Peas	Northern Idaho Fertilizer guide Spring Peas	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1084.pdf	CIS-1084	2005	ID
grain	Peas	fertilizer Guide: Peas, Eastern Oregon	http://extension.oregonstate.edu/catalog/details.php?search=peas	FG-72	2000	OR
grain	Peas	Fertilizer Guide: Crimson Clover, Vetch, and Field Peas, Western ...	http://ir.library.oregonstate.edu/xmlui/handle/1957/20637?show=full	Fg-30-e	2000	OR
grain	Rapeseed, Winter	Northern Idaho fertilizer guide: Winter Rapeseed	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0785.pdf	CIS-785	2005	ID
grain	Wheat	Nitrogen Management for hard wheat protein enhancement	http://www.cals.uidaho.edu/edComm/pdf/PNW/PNW0578.pdf	PNW-578	2005	WA,OR,ID
grain	Wheat	Fertilizer Guide: Irrigated Wheat, Eastern Oregon	http://extension.oregonstate.edu/catalog/details.php?search=irrigate+wheat	FG-40-e	2000	OR
grain	Wheat	Southern Idaho Fertilizer Guide Irrigated Spring Wheat	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0828.pdf	CIS-828	2001	ID
grain	Wheat	Southern Idaho Fertilizer guide Irrigated Winter Wheat	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0373.pdf	CIS-373	2001	ID
grain	Wheat	Double-Cropped winter forages	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0869.pdf	BUL-869	2009	ID
grain	wheat	Fertilizer Guide: Spring-planted Grains	http://extension.oregonstate.edu/catalog/details.php?search=spring+planted+grains	FG-70	2000	OR
grain	wheat	Fertilizer Guide: Irrigated Spring-planted Small Grains--Mineral Soils ...	http://extension.oregonstate.edu/catalog/details.php?search=spring+planted+grains	fg-37-e	2000	OR
grain	Wheat	Northern Idaho Fertilizer guide Soft white spring wheat	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1101.pdf	CIS-1101	2007	ID
grain	Wheat	Phosphorus fertilization of late-planted Winter Wheat in No-till Fallow	http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/28588/pnw631.pdf	PNW-631	2012	WA,OR,ID
grain	Wheat	Double-Cropped winter forages	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0869.pdf	BUL-869	2009	ID
grain	Wheat	growing wheat in western Washington	http://cru.cahe.wsu.edu/CEPublications/EM022E/EM022E.pdf	EM-022E	2009	WA
grain	Wheat	Dryland Wheat, Eastern Washington Nutrient Management Guide	https://pubs.wsu.edu/ListItems.aspx?Keyword=eb%201987	EB1987	2008	WA
grain	Wheat	Northern Idaho Fertilizer guide Winter Wheat	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0453.pdf	CIS-453	2007	ID
grain	Wheat	Developing Fertilizer Recommendations for Agriculture	http://store.msuextension.org/Products/Developing-Fertilizer-Recommendations-for-Agriculture__MT200703AG.aspx	MT200703AG	2007	MT
grain	Wheat	Fertilizer Guide: Winter Wheat in Continuous Cropping Systems (high precipitation zone)	http://search.oregonstate.edu/index.php?q=winter%20wheat%20in%20continuous%20cropping%20systems&spell=1&output=xml&site=All&client=default_frontend&ie=UTF-8&access=p	FG-84	2007	OR
grain	Wheat	Fertilizer guidelines for Montana Crops	http://msuextension.org/publications/AgandNaturalResources/EB0161.pdf	EB-161	2005	MT

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grain	Wheat	Winter Wheat and Spring Grains in Continuous cropping systems fert guide (low precip)	http://extension.oregonstate.edu/umatilla/sites/default/files/cereals/Publications/fg81-e.pdf	FG-81-E	2005	OR
grain	Wheat	Winter Wheat in continuous cropping system fert guide (intermediate precip)	http://extension.oregonstate.edu/umatilla/sites/default/files/cereals/Publications/fg83-e.pdf	FG-83-E	2005	OR
grain	Wheat	Southern Idaho Dryland Winter Wheat Production Guide	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0827.pdf	BUL-827	2004	ID
grain	Wheat	Fertilizer Guide for Winter Wheat Western Oregon-West of Cascades	http://www.oregon.gov/ODA/PEST/docs/pdf/97_07_fg9.pdf	FG-9	2000	OR
seed	Fescue, Fine, Seed	Fertilizer Guide: Fine Fescue Seed (Western Oregon--West of ...	http://extension.oregonstate.edu/linn/search/fertilizer%252Bguide%252Bfescue%252Bseed/0/4	FG-6-E	2003	OR
seed	Fescue, Tall	Fertilizer Guide: Tall fescue grown for seed	http://extension.oregonstate.edu/linn/search/fertilizer%252Bguide%252Btall%252Bfescue%252Bseed/0/4	FG-36-E	2005	OR
seed	Onion and Leek Seed	Onion and Leek Seed Production	http://www.cals.uidaho.edu/edComm/detail.asp?IDnum=358	PNW-433	1993	WA,OR,ID
seed	Orchard grass seed	Fertilizer Guide: Orchardgrass Seed, Western Oregon	http://extension.oregonstate.edu/catalog/details.php?search=orchardgrass	FG-45	2000	OR
seed	Orchard grass, seed	Grass Seed Production Guide for Utah	https://uaes.usu.edu/?search=grass+seed+production+guide+for+utah&searchType=1	AG 437	1990	UT
seed	Ryegrass, perennial, seed	Perennial Ryegrass Grown for Seed, Fertilizer Guide (Western ...	http://extension.oregonstate.edu/catalog/details.php?sortnum=0134&name=Fertilizer+Guides&cat=Agriculture&num_results1=52&s=24&num_pages=5&sort=snumbera	FG-46-E	2005	OR
vegetable	Asparagus	Asparagus Production in California	http://anrcatalog.ucdavis.edu/pdf/7234.pdf	ANR Publication 7234	2011	CA
vegetable	Asparagus	Utah Fertilizer Guide	http://extension.usu.edu/files/publications/publication/AG_431.pdf	AG-431	2010	UT
vegetable	Bean	Fertilizer Guide: Bush Beans, Western Oregon	http://extension.oregonstate.edu/catalog/details.php?search=fertilizer+guide+bush+beans	FG-28	2000	OR
vegetable	Beet	Southern Idaho Fertilizer guide: Sugar Beets	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1174.pdf	CIS-1174	2009	ID
vegetable	Beet	Fertilizer Guide: Table Beets, Western Oregon	http://extension.oregonstate.edu/catalog/details.php?search=fertilizer+guide+table+beets	FG-13	2000	OR
vegetable	Broccoli	Nitrogen Uptake and Utilization by Pacific Northwest field crops	http://extension.oregonstate.edu/catalog/details.php?search=nitrogen+uptake	PNW-513	1999	WA,OR,ID
vegetable	Cabbage	Cabbage Production in California	http://anrcatalog.ucdavis.edu/pdf/7208.pdf	ANR Publication 7208	2008	CA
vegetable	Carrot	Carrot Production in California	http://anrcatalog.ucdavis.edu/pdf/7226.pdf	ANR publication 7226	2008	CA
vegetable	Cauliflower	Cauliflower Production in California	http://anrcatalog.ucdavis.edu/pdf/7219.pdf	ANR Publication 7219	2009	CA
vegetable	celery	Celery Production in California	http://anrcatalog.ucdavis.edu/pdf/7220.pdf	ANR Publication 7220	2008	CA
vegetable	Cucumber	Cucumber Production in California	http://anrcatalog.ucdavis.edu/pdf/8050.pdf	ANR Publication 8050	2002	CA
vegetable	Eggplant	Eggplant Production in California	http://anrcatalog.ucdavis.edu/pdf/7235.pdf	ANR Publication 7235	1998	CA
vegetable	Lettuce	Iceberg Lettuce Production in California	http://anrcatalog.ucdavis.edu/pdf/7215.pdf	ANR Publication 7215	2011	CA
vegetable	Lettuce	Leaf Lettuce Production in California	http://anrcatalog.ucdavis.edu/pdf/7216.pdf	ANR Publication 7216	2011	CA
vegetable	Okra	Okra Production in California	http://anrcatalog.ucdavis.edu/pdf/7210.pdf	ANR Publication 7210	2011	CA
vegetable	Onion	Fresh-Market Bulbs Onion Production in California	http://anrcatalog.ucdavis.edu/pdf/7242.pdf	ANR Publication 7242	2011	CA
vegetable	Onion	Green Onion Production in California	http://anrcatalog.ucdavis.edu/pdf/7243.pdf	ANR Publication 7243	2011	CA
vegetable	Onion	Nutrient Management for Onions in the Pacific Northwest	http://extension.oregonstate.edu/catalog/details.php?search=nitrogen+uptake	PNW-546	2001	WA,OR,ID
vegetable	Onion	Southern Idaho Fertilizer guide: Onions	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1081.pdf	CIS-1081	2000	ID
vegetable	Pea Shoots	Pea Shoots	http://cru.cahe.wsu.edu/CEPublications/PNW0567/PNW0567.pdf	PNW-567	2003	WA,OR,ID
vegetable	Pepper	Chile Pepper Production in California	http://anrcatalog.ucdavis.edu/pdf/7244.pdf	ANR Publication 7244	2011	CA
vegetable	Pepper	Bell Pepper Production in California	http://anrcatalog.ucdavis.edu/pdf/7217.pdf	ANR publication 7217	2008	CA
vegetable	Peppermint	Fertilizer Guide: Peppermint, Western Oregon	http://extension.oregonstate.edu/catalog/details.php?search=peppermint	FG-15	2000	OR
vegetable	Potato	Cultural management of Classic Russet Potatoes	http://www.cals.uidaho.edu/edComm/pdf/cis/cis1181.pdf	CIS-1181	2011	ID
vegetable	Potato	Cultural management of Blazer Russet Potatoes	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1149.pdf	CIS-1149	2008	ID

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vegetable	Potato	Cultural Management of Western Russet Potatoes	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1152.pdf	CIS-1152	2008	ID
vegetable	Potato	Nutrient Management guidelines for Russet burbank potatoes	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0840.pdf	BUL-840	2004	ID
vegetable	Potato	Potato production with limited water supply	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1122.pdf	CIS-1122	2004	ID
vegetable	Potato	Cultural Management of Russet Norkotah Potatoes	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1106.pdf	CIS-863	2003	ID
vegetable	Potato	Cultural management of Bannock Russet Potatoes	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1103.pdf	CIS-1103	2002	ID
vegetable	Potato	Cultural management of Gem Russet Potatoes	http://search.atomz.com/search/?sp_a=sp1004d68f&sp_q=cultural+management+of+gem+russet+potatoes&sp_p=all&sp_f=UTF-8	CIS-1093	2001	ID
vegetable	Potato	Cultural management of Ranger Russet Potatoes	http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS0919.pdf	CIS-919	1998	ID
vegetable	Pumpkin	Western Oregon Vine Crops Fertilizer guide Cucumber, Melons, Squash, Pumpkins	http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/20639/fg68-e.pdf	FG-68	1990	OR
vegetable	Spinach	Spinach Production in California	http://anrcatalog.ucdavis.edu/pdf/7212.pdf	ANR Publication 7212	2011	CA
vegetable	Squash	Summer Squash Production in California	http://anrcatalog.ucdavis.edu/pdf/7245.pdf	ANR Publication 7245	1999	CA
vegetable	Swiss Chard	Beet and Swiss Chard Production in California	http://anrcatalog.ucdavis.edu/pdf/8096.pdf	ANR Publication 8096	2003	CA
vegetable	Tomatillo	Tomatillo Production in California	http://anrcatalog.ucdavis.edu/pdf/7246.pdf	ANR Publication 7246	1999	CA
vegetable	Tomato	Fresh-Market Tomato Production in California	http://anrcatalog.ucdavis.edu/pdf/8017.pdf	ANR Publication 8017	2000	CA
vegetable	Tomato	Growing Processing tomatoes in central WA	This is a book, sold on Amazon	EB-1545	1990	WA
vegetable	Wasabi	Growing Wasabi in the Pacific Northwest	http://cru.cahe.wsu.edu/CEPublications/pnw0605/pnw0605.pdf	PNW-0605	2008	WA, OR, ID
other	Christmas Trees	Christmas Tree Nutrient Management Guide for Western Oregon and	http://extension.oregonstate.edu/catalog/details.php?search=nutrient_management&num_results1=42&s=12&num_pages=4&sort=snumbera	EM-8856-E	2004	OR
other	Christmas trees	Growing Christmas Trees in the Pacific Northwest	http://www.cals.uidaho.edu/edComm/detail.asp?IDnum=219	PNW-6	2003	WA,OR,ID
other	Cosmos	Nutrient Management in Nursery and Floriculture	http://anrcatalog.ucdavis.edu/pdf/8221.pdf	ANR publication 8221	2007	CA
other	Hops	Hops Fertilizer Guide	http://extension.oregonstate.edu/catalog/details.php?search=hop+fertilizer+guide	FG-79	2000	OR
General	Many crops	Utah Fertilizer Guide	http://extension.usu.edu/files/publications/publication/AG_431.pdf	AG-431	2010	UT
General	Many crops	Fertilizer guidelines for Montana Crops	http://msuextension.org/publications/AgandNaturalResources/EB0161.pdf	EB-161	2005	MT
General	Many crops	Nitrogen Uptake and Utilization by Pacific Northwest field crops	http://extension.oregonstate.edu/catalog/details.php?search=nitrogen+uptake+and+utilization+	PNW-513	1999	WA,OR,ID
Manure et	Biosolids	Fertilizing With Biosolids	http://extension.oregonstate.edu/catalog/details.php?search=biosolids	PNW-508	2007	WA, OR, ID
Manure et	Biosolids	Worksheet for Calculating Biosolids Application Rates in Agriculture	http://cru.cahe.wsu.edu/CEPublications/PNW0511e/PNW0511e.pdf	PNW-511	2007	WA, OR, ID
Manure et	Manure	Fertilizing with Manure	http://cru.cahe.wsu.edu/CEPublications/PNW0533/PNW0533.pdf	PNW-533	2004	WA, OR, ID
Manure et	Manure	Optimal Utilization of Animal Manure on Cropland	http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0829.pdf	BUL-829	2001	ID
Manure et	Organic amendments	Organic fertilizer and cover crop calculator	http://smallfarms.oregonstate.edu/calculator		2010	OR
Manure et	Organic amendments	Soil Fertility Management for Organic Crops	http://anrcatalog.ucdavis.edu/pdf/7249.pdf	ANR publication 7429	2007	CA
Manure et	Organic amendments	Soil Management for Small Farms	http://cru.cahe.wsu.edu/CEPublications/eb1895/eb1895.pdf	EB-1895	2000	WA, OR, ID

The recommendations in these publications are intended as guidelines for the economically efficient use of fertilizers: to supply enough nutrients to meet crop needs, while avoiding the cost of unnecessary nutrients. The point at which excess nutrient levels in the soil become an environmental concern is not necessarily the same as the economically optimum range. This is true for phosphorus, where soil test levels of environmental concern are much greater than crop sufficiency levels. Organic types of fertilizers, such as manures or biosolids, supply excess phosphorus when applied at rates to meet crop nitrogen needs. Their application rates should not be based on economic phosphorus recommendations in the fertilizer guides, but rather in the context of the Phosphorus Index, which is focused specifically on environmental concerns.

Craig Cogger, Key Destalew, Andy Bary, Joe Harrison, and Rich Koenig - Washington State University Extension - May 17, 2013