Center for
Sustaining Agriculture
& Natural Resources
WASHINGTON STATE UNIVERSITY

Survey on the Use of Biofertilizers

Washington State University is conducting a study to guide the development of a soil amendment derived from dairy manure, which is sometimes to referred to as a type of "biofertilizer." The goal of this study is to help gauge farmers' interest in using this product and to understand which features of this soil amendment are most important to them.

This survey is meant to be filled out by individuals making fertilizer and soil amendment decisions at their operation . Please only complete the following survey if you fit this description. If you need clarification on any part this survey, please contact khills@wsu.edu.

Biofertilizer

This product is created through separation of fine solids from dairy manure liquids, through a process called Dissolved Air Flotation, or DAF. This is a different process than the one that produces "separated dairy solids," which are coarser, and have a lower nutrient content. (To learn more about the DAF process, see Box 1.) This product benefits dairies by helping them better manage their nutrient levels. It also recycles nutrients from animal farms to crop systems, replacing some fertilizer inputs.

Box 1. Dissolved Air Flotation

The DAF process is used after large particles and easily settled solids are first separated from dairy manure in the form of coarse solids or fiber. During the DAF process, air bubbles and organic polymer are injected into a tank and cause the solids to float to the surface where they can be skimmed *off,* dewatered, and stored. Meanwhile, the remaining wastewater can be more efficiently applied to crops.

The nutrient content of the resulting fine solid product is approximately 4 - 4-1 (% NPK on a dry weight basis). Of the nitrogen present in the product, 95% of it is in the form of organic nitrogen (slow release), and about 5% is in the form of ammonia nitrogen (immediately plant available). It also provides carbon - which like other soil amendments, will benefit soil health when added to soils. The carbon to nitrogen ratio is about 9:1. The product has a low to moderate salinity level. For the purposes of this survey, assume that this product can be used on certified organic ground. We would also ask you to assume that the use of this product will introduce no additional food safety risks and no additional regulatory requirements for your operation.

The technology to create this product is still in development, so the final product might take different forms. Part of the objective of our research is to understand which elements are important to growers to inform further technological development of biofertilizers. You will answer several questions about whether you would use a biofertilizer or would instead use your current soil amendments and fertilizers. The three attributes of the biofertilizer that will be varied are: the form of the biofertilizer, whether it's available through fertilizer dealers , and its cost relative to your existing fertilizer costs.

The first attribute is the **form of the product.** Possible forms of the product and equipment that can be used to spread each form are shown below. None of these forms can be applied through fertigation.

Semi-wet (75% moisture) : can be applied using a solid manure spreader.

Air dried: can be applied using a sawdust spreader (like the one pictured below) or equipment used to spread dry compost.

Pelletized : can be applied using a fertilizer spreader and blended with similar products. This photo shows biofertilizer in pelletized form, but the sample provided is chicken manure.

The second attribute is **how you would purchase it.** The product would either be available through the channels where you typically buy fertilizer and soil amendments or through a separate company.

The final attribute is **the product's cost to you.** To avoid asking detailed information about how much you are spending on your current fertilizers and soil amendments, the cost will be expressed as a percentage of your current spending, including the cost of application and incorporation. For example, if you are currently spending $100 per acre on fertilizers and soil amendments, and an option given indicates that using biofertilizer would reduce costs to 75% of your current costs, this means you should expect that including biofertilizer in your fertilizer regime will lead to a total cost of $75 per acre.

Because the nutrient content of the biofertilizer may be less than the fertilizer than a product you are currently using, it may require more trips across the field to achieve the same level of nutrient application. *Consider the cost of any additional trips as part of the "applied cost" reflected in the questions.*

Section A

Before completing the rest of the survey, please answer the following questions about your operation, current soil amendments, and spreading equipment.

A.1 What crops do you grow on the acres that you manage?

_____

_____

_____

A.2 How many acres do you manage in an average year? _____acres

A.3 What percent of those acres are certified organic?

☐ 0% ☐ 1-10% ☐ 10-50% ☐ 50-90% ☐ 90-100% ☐ 100%

A.4 How many years have you been managing crops?_____years

A.5 Do you already use manure-based amendments? ☐ yes ☐ no

If yes, what type(s)?_____

A.6 Because the product described in this survey is a new product, we wouldn't expect that most growers would replace all of the fertilizers and soil amendments that they currently use with the biofert ili zer. Instead, you may think about using the biofertilizer in a portion of your operation. Given what you know, which approach(es) might you take to using this product? Choose all that apply.

☐ Use on specific crop(s)_____

☐ Use on a percentage of your ground. What%?_____

☐ Replace a percentage of nutrients applied. What%?_____

☐ Other. Describe: _____

☐ Not sure.

A.7 Which soil amendment or fertilizers that you currently use are the ones you would be most likely to partially or completely replace with a dairy-manure derived biofertilizer?

_____

A.8 What type of equipment do you use to spread this product?

_____

A.9 What spreading equipment is currently used in your operation? Please check all that apply and indicate whether the equipment is owned, leased, or operated by a custom applicator.

Solid manure spreader	☐ owned	☐ leased	☐ custom applicator
Spreader suitable for compost or sawdust	☐ owned	☐ leased	☐ custom applicator
Fertilizer spreader (for pelletized products)	☐ owned	☐ leased	☐ custom applicator
Other:	☐ owned	☐ leased	☐ custom applicator
Other:	☐ owned	☐ leased	☐ custom applicator

Section B.

In the next part of the survey, we will ask you to make choices in five hypothetical scenarios. In each scenario, like the first one below, there are three choices. Two on the left are biofertilizer options that will vary in terms of form, distribution and cost . The third on the right is your current soil amendments. Recall that cost is expressed as a percentage of your current costs, including application costs, so Option C (your current amendments) will always be 100%. Although this is a hypothetical question, please think carefully about what you might do if these biofertilizer options were really available to you in the market . Please rank Options A, B, and C with **1 indicating the best choice,** and **3 indicating the worst choice.**

Choice Task 1

	Biofertilizer Option A	**Biofertilizer Option B**	**Option C: Your current soil amendments, no biofertilizer**
FORM	Semi-wet (75% moisture)	Pelletized	
DISTRIBUTION	Through your current distributor	Must be purchased through a separate company	
COST, APPLIED	75% of your current cost	same (100%) as your current cost	100%
RANK THESE OPTIONS **1= best, 3=worst**			

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1.1 In this choice, how certain did you feel about your ranking?

(1) ☐ Very certain (2) ☐ Somewhat certain (3) ☐ Somewhat uncertain (4) ☐ Very uncertain

1.2 In this choice, which of these attributes did you **ignore?** (check all that apply)

☐ form ☐ distribution ☐ cost

Below are four more tasks like that one. In each task, the attributes of the biofertilizer will be different, so please examine each one carefully.

Choice Task 2

	Biofertilizer Option A	**Biofertilizer Option B**	**Option C: Your current soil amendments, no biofertilizer**
FORM	Pelletized	Air-dried	
DISTRIBUTION	Must be purchased through a separate company	Through your current distributor	
COST, APPLIED	75% of your current cost	same (100%) as your current cost	100%
RANK THESE OPTIONS 1= best, 3=worst			

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2.1 In this choice, how certain did you feel about your ranking?

(1) ☐ Very certain (2) ☐ Somewhat certain (3) ☐ Somewhat uncertain (4) ☐ Very uncertain

2.2 In this choice, which of these attributes did you **ignore?** (check all that apply)

☐ form ☐ distribution ☐ cost

Choice Task 3

	Biofertilizer Option A	**Biofertilizer Option B**	**Option C: Your current soil amendments, no biofertilizer**
FORM	Semi-wet (75% moisture)	Pelletized	
DISTRIBUTION	Through your current distributor	Must be purchased through a separate company	
COST, APPLIED	50% of your current cost	same (100%) as your current cost	100%
RANK THESE OPTIONS 1= best, 3=worst			

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3.1 In this choice, how certain did you feel about your ranking?

(1) ☐ Very certain (2) ☐ Somewhat certain (3) ☐ Somewhat uncertain (4) ☐ Very uncertain

3.2 In this choice, which of these attributes did you **ignore?** (check all that apply)

☐ form ☐ distribution ☐ cost

Choice Task 4

	Biofertilizer Option A	**Biofertilizer Option B**	**Option C: Your current soil amendments, no biofertilizer**
FORM	Semi-wet (75% moisture)	Air-dried	
DISTRIBUTION	Through your current distributor	Must be purchased through a separate company	
COST, APPLIED	50% of your current cost	same (100%) as your current cost	100%
RANK THESE OPTIONS 1= best, 3=worst			

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4.1 In this choice, how certain did you feel about your ranking?

(1) ☐ Very certain (2) ☐ Somewhat certain (3) ☐ Somewhat uncertain (4) ☐ Very uncertain

4.2 In this choice, which of these attributes did you **ignore?** (check all that apply)

☐ form ☐ distribution ☐ cost

Choice Task 5

	Biofertilizer Option A	**Biofertilizer Option B**	**Option C: Your current soil amendments, no biofertilizer**
FORM	Pelletized	Semi-wet (75% moisture)	
DISTRIBUTION	Through your current distributor	Through your current distributor	
COST, APPLIED	50% of your current cost	75% of your current cost	100%
RANK 1= best, 3=worst			

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5.1 In this choice, how certain did you feel about your ranking?

(1) ☐ Very certain (2) ☐ Somewhat certain (3) ☐ Somewhat uncertain (4) ☐ Very uncertain

5.2 In this choice , which of these attributes did you **ignore?** (check all that apply)

D form D distribution D cost

If you ranked Option C (your current soil amendments, no biofertilizer) highest **in all of the five choice tasks above,** please complete the questions in Section C, otherwise move to Section D.

Section C

C.1 What is the main reason that you never ranked a biofertilizer product as your top choice?

C.2 Are there any circumstances under which you would consider choosing a manure-derived soil amendment product? If yes, what would it take?

Section D

D.1 Are there any concerns that you have about using a new soil amendment of the type that we have described? If so, please describe.

Debrief

We told you for purposes of the study that we wanted you to assume that the product could be used on certified organic ground, did not introduce additional food safety risks, and did not add any regulatory requirement s. At this time, the product is still in development and cannot be organically certified due to the polymer used, though some have explored whether the process could be changed so that it could be certified. WSU has been investigating the question of whether using this product impacts food safety risk, although it is unlikely to add any food safety risk beyond that of manures when the biofertilizer is applied like manure. We are not aware that using biofertilizers adds any additional regulatory requirements.

Thank you very much for your time. If you would us to share the results of this study with you and have not already provided your email for this purpose, please write it below or email Karen Hills (khills@wsu.edu).

Email (optional):_____