



The role of organic matter amendments in tree and soil health – a grower oriented analysis



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Interpretive Summary

There is a large excess of organic matter amendments including manure and green waste in composted and uncomposted forms in California and a lack of knowledge of how these materials may be used to benefit almond production. An exploratory project was conducted to improve our understanding of the potential benefits and concerns with the use of organic matter amendments. These materials are excellent sources of nutrients and organic matter that could benefit tree and soil health, but significant concerns exist. We conducted a mixed-mode grower survey to approach the problem.

Objectives

- To map the extent of use in the Central Valley
- To identify benefits and concerns by user and avoidance groups
- To uncover if any issues of access exist
- To determine different management by form

Materials and Methods

To understand the use of organic matter amendments in almond, a mail survey was developed to reach the population of California almond growers using membership lists provided by the Almond Board of California and by the Blue Diamond Growers (Dillman 2008). The final survey was delivered to 6,237 unique addresses. The survey opened with a question about what areas benefit from the use of organic matter amendments and was followed by questions relevant to the orchard life cycle including practices at planting, non-bearing and bearing stages. An emphasis was made to separate the timing, placement, management and issues of concern for composted and raw manure as well as green waste compost and uncomposted green waste. A question was included about grower access to manure and green waste. Tables and figures are constructed with percentage responses, and the map displays use frequency by county. The *user group* is categorized by grower responses indicating the use of organic matter amendments during planting, non-bearing and or bearing of almond. The *avoidance group* is categorized by grower responses indicating no use during any orchard stage.

Results

Survey overview

Results were gathered and analyzed as of November 30th 2014. The total number of replies was 1657 out of a total of 6,237 mailings for a 26.6% response rate. The number of surveys returned was 989 with 89 completed over the internet and the remainder by mail. There were 398 were opt outs with the remainder as unprocessed mail. The response rate in acreage was higher at 31.9% or 300,157 acres out of ~940,000 reported in the 2013 almond acreage report (NASS 2013). The participants indicating high or very high use was in San Joaquin, Stanislaus, Merced and Fresno counties (Figure 1).

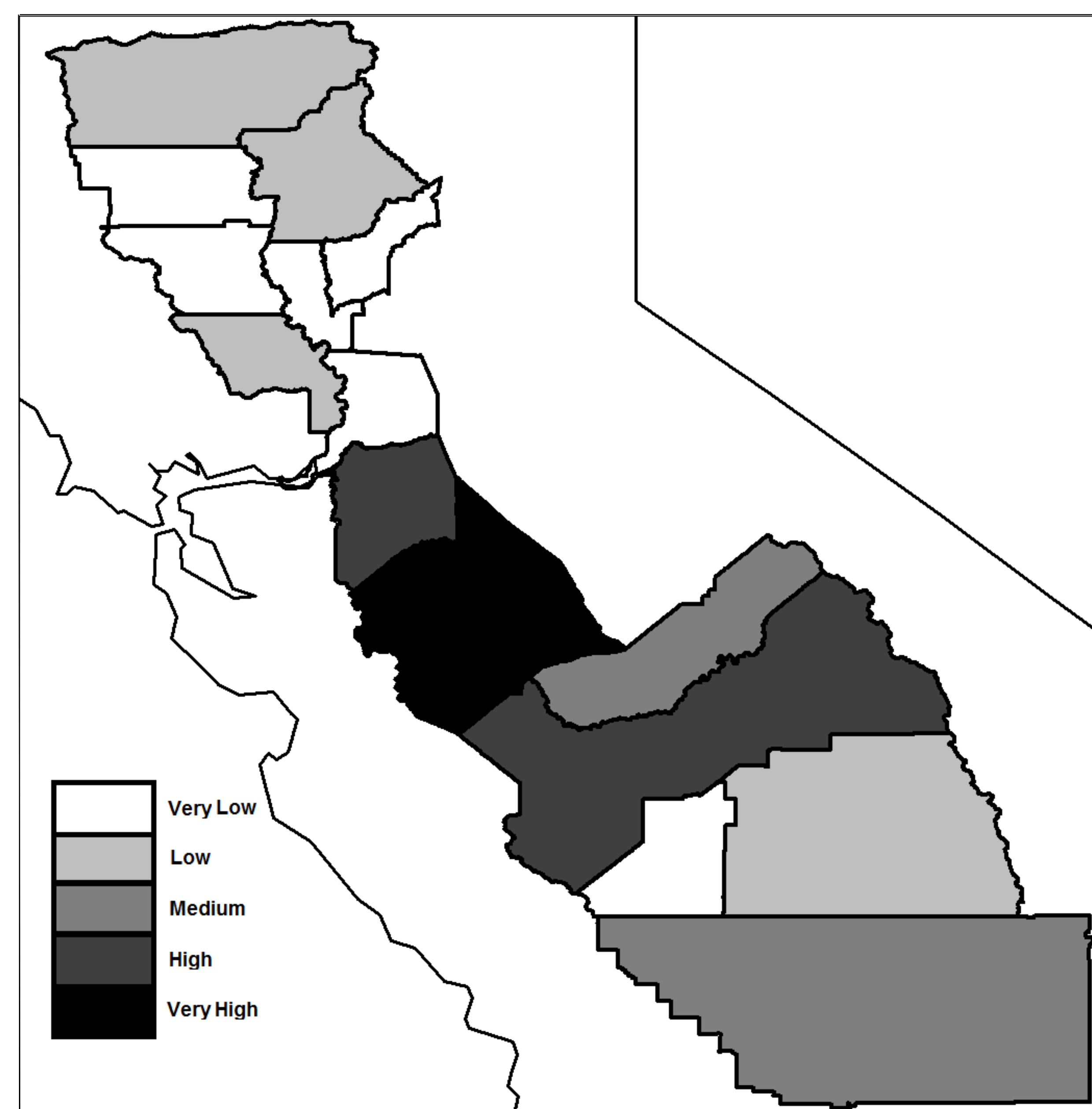


Figure 1. Frequency of responses where grower participants indicated the use of organic matter amendments during any orchard stage presented geospatially by county. Where the level of response is very low (1-10), low (11-30), medium (31-60), high (61-110) or very high (111-180).

Benefits & Concerns

Participants were asked to rank what benefits including soil biology, tree nutrition and water holding capacity are expected from the use of organic matter amendments. The greatest benefit was attributed to soil biology for both the user and avoidance groups (50% for both) followed by tree nutrition (38% and 36%). A greater percentage of the user group reported water holding capacity as the least benefit of the three (Figure 2).

Food safety was the issue of greatest concern with a greater response from the avoidance (70%) versus user group (58%), followed by nutrient availability as secondary for the user groups (49%) and cost & logistics secondary for the avoidance group (46%).

Access

Growers in the user group reported good or better access to manure (66%) compared to green waste (53%). Conversely, the avoidance group reported good or worse access to manure (84%) and green waste (94%) (Figure 3). This results suggest an access issue for the avoidance group.

More Results

Management

There was greater use of composted materials than uncomposted ones during all orchard stages (Table 1). Responses for the timing of application, placement and management differ between composted or uncomposted organic matter amendments. The vast majority of materials were applied from postharvest to bloom (80% - 95%). The placement of composted manure (53%) and green waste compost (58%) on the tree berm was greater than raw manure and uncomposted green waste. Furthermore, there was greater incidence of no-tillage being used with composted manure (76%) and green waste compost (80%) compared to raw manure (46%). No-tillage practices were also used with cover crops (82%) and chopped prunings (79%) by growers (Table 2).

Table 1. Response percentages for the use of organic matter amendments in different forms during planting non-bearing and bearing stages of orchard development.

	Planting	Non-bearing	Bearing
Composted Manure	43%	46%	43%
Green Waste Compost	33%	29%	28%
Raw Manure	21%	20%	18%
Uncomposted Green Waste	3%	5%	11%

Table 2. Response percentages for use of organic matter amendments in different forms including timing, placement and management and cover crops, chopped prunings and chipped wood.

	Postharvest to Bloom	Spring to Summer	All Year
Composted Manure	95%	2%	3%
Green Waste Compost	86%	7%	7%
Raw Manure	94%	3%	3%
Uncomposted Green Waste	80%	10%	10%
	Tree Berm	Alleyway	Whole Orchard
Composted Manure	53%	30%	17%
Green Waste Compost	58%	23%	19%
Raw Manure	24%	55%	21%
Uncomposted Green Waste	17%	73%	10%
	Incorporation	Light Disking	No-tillage
Composted Manure	14%	10%	76%
Green Waste Compost	11%	9%	80%
Raw Manure	32%	22%	46%
Uncomposted Green Waste	22%	14%	64%
Cover Crops	8%	10%	82%
Chopped Prunings	14%	7%	79%
	Haul Away	Left in Field	Burn
Chipped Wood	62%	15%	23%

Conclusions

Growers attributed soil biology benefits to the use of organic matter amendments. They also appeared to use greater amounts of composted compared to raw or uncomposted materials. Grower use of composted materials fits with no-tillage practices and targets greater placement in the tree berm. Composting may resolve the greatest concern of food safety. Yet a secondary concern remains in terms of nutrient availability from the compost as well as how the compost interacts with other fertilizers. This issue may further interact with soil biology. The avoidance group of growers places a greater emphasis on food safety as a concern while reports greater difficulty with access to organic matter amendments in multiple forms.

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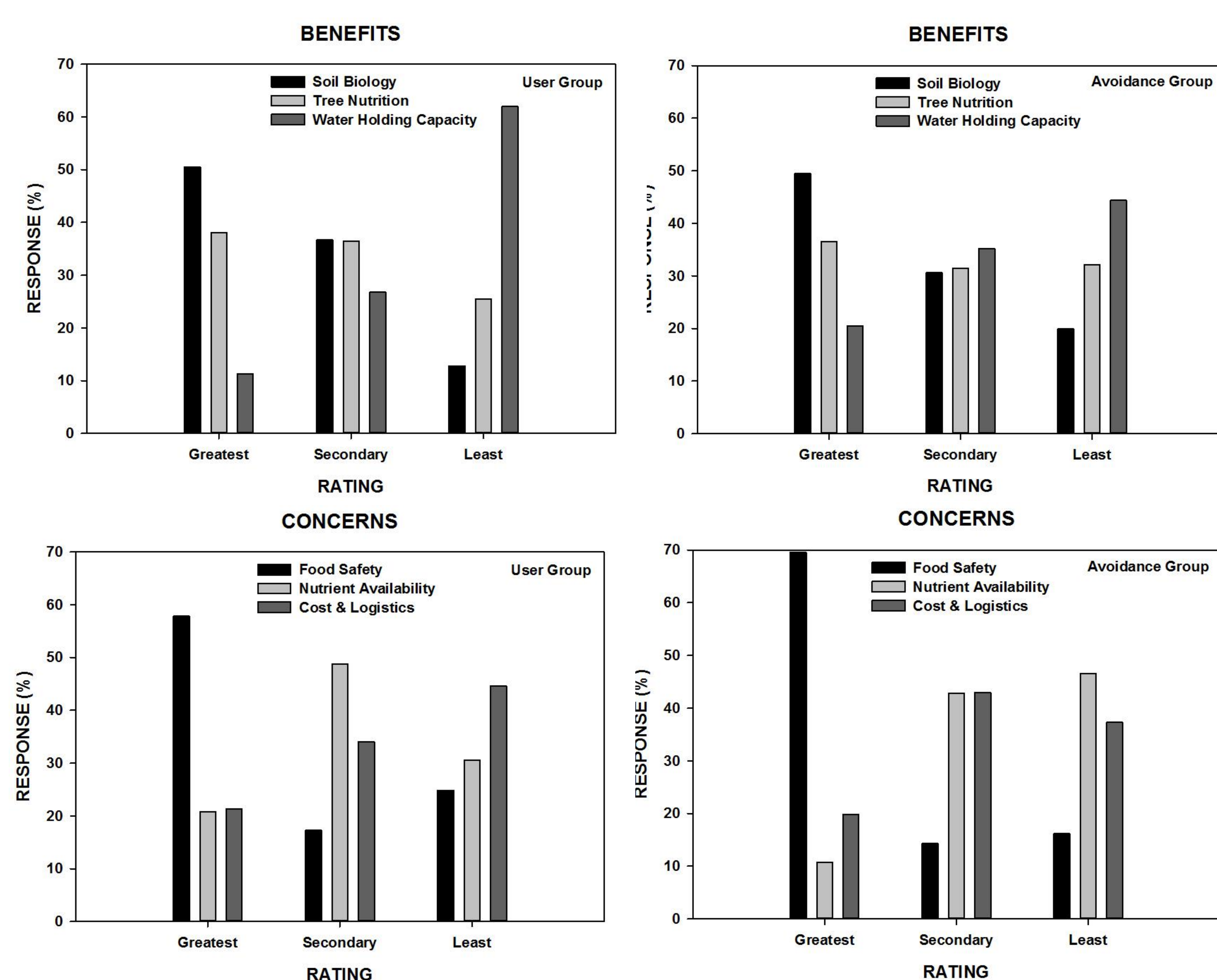


Figure 2. Grower response percentage of benefits including soil biology, tree nutrition, water holding capacity and concerns including food safety, nutrient availability, cost & logistics from organic matter amendments by user and avoidance groups rating the benefit or concern as the greatest, secondary or least important.

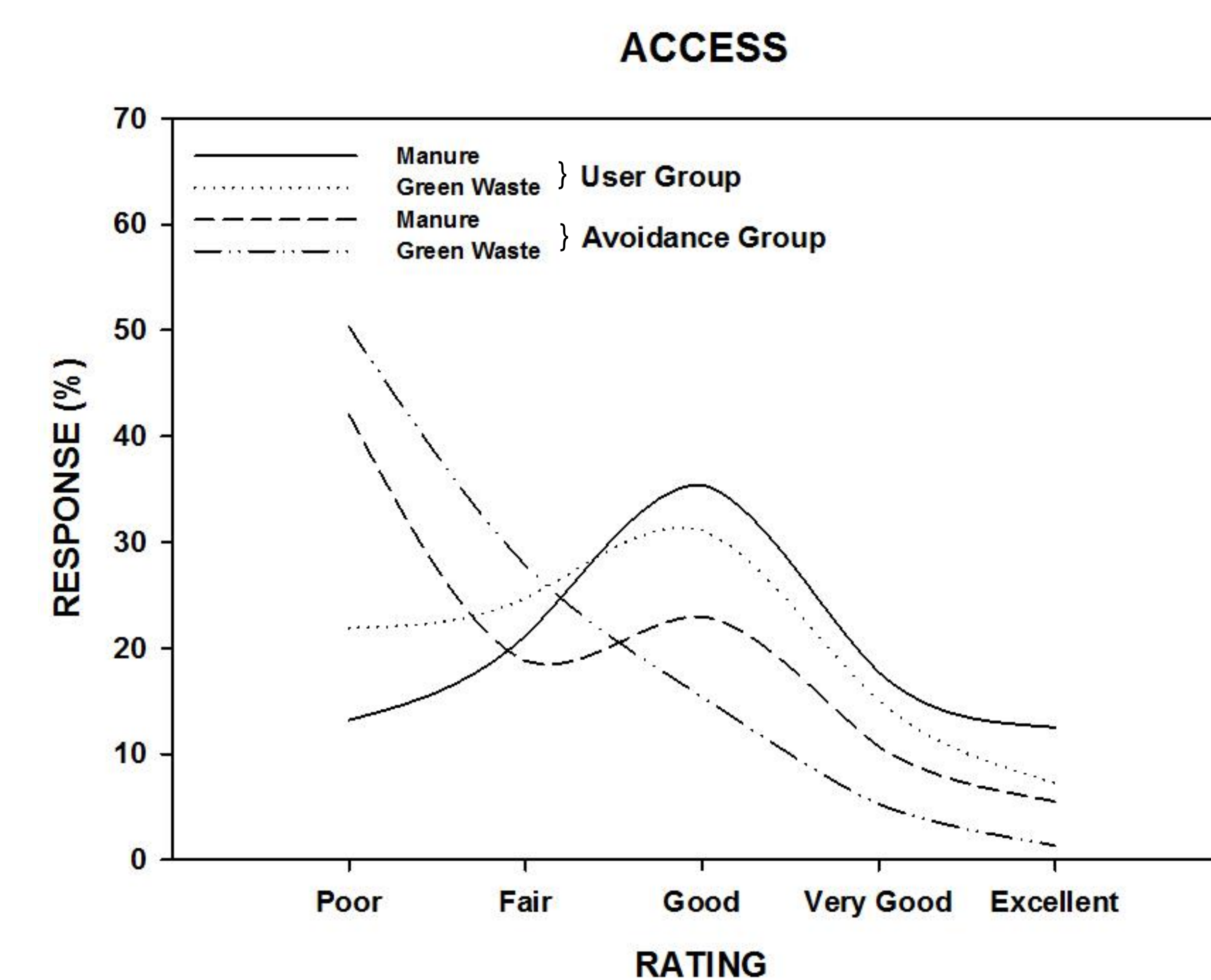


Figure 3. Grower response percentage of access to organic matter amendments including manure and green waste by user and avoidance groups rating access as poor, fair, good, very good or excellent.