APPENDIX B

Lombardini, Leonardo Ph.D.

Volume 1 - 06/10/2020

Summary Proceeding with Highlighted Clips
Printed 08/25/2021 03:31PM CDT

CONFIDENTIAL

NM Direct Designation

Page 00007

12: Q. (BY MR. DRAPER) Okay. Great. All right.
13: Dr. Lombardini, would you state your full name for the
14: record and your professional address?
15: A. Sure. My name is Leonardo, L-E-O-N-A-R-D-O,
16: Lombardini, L-O-M-B-A-R-D-I-N-I, and I am currently
17: the head of the horticulture department of the
18: University of Georgia, so my office is on campus. We
19: do not represent the university in this -- in this
20: particular circumstance.
21: Q. And the university is located in Athens,
22: Georgia?
23: A. In Athens, Georgia. That is correct. I

Page 00014

09: in this case, and I'd just like to confirm. You're
10: appearing here as a soil salinity expert, correct?
11: A. That's correct. That's the original role
12: when I was first retained by Somach Simmons & Dunn. I
13: am more a plant expert, so salinity expert but not
14: necessarily a soil salinity expert, more like the
15: effect of soil salinity on plants, plant -- in this
16: case, I focused on pecans. So, yeah, so what I did to

Page 00016

02: Q. Yes. Well, one of the main things you did
03: here was to -- was to conduct a field visit and -- and
04: data collection in the area. Would you describe what
05: you did in carrying that out?
06: A. Yes. I -- I -- I traveled twice to the
07: region, so New Mexico and West Texas, to collect water
08: samples, soil samples, and leaf samples. Any time
09: there is toxicity or just you want to know the -- the

growing condition of plants, those are the three parameters that you should investigate. One by itself usually doesn't tell the whole story, but just by investigating soil, water, and leaf tissues, you get a pretty good picture. Having said that, usually for studies like this, a repeated analysis, multiple years, would be beneficial. If I had to use the data I collected for publication, scientific publication, what I collected last year would not be enough. I would have to repeat at least two times, three times, the more the merrier obviously. But -- so what I did is take a snapshot of what the situation was last summer.

Q. How did you go about doing that -- that study, that visit?

A. First, I identified sites, and initially, I

Page 00017

was going to concentrate on both pecans and also vegetable crops, but we realized that we didn't have enough sites for annual crops, so we just focused on pecans. So identify locations using Google Earth because pecan orchards are actually easy to identify on aerial images, satellite images. It wouldn't be so easy if, let's say, it was California where many other tree -- fruit trees are grown, but definitely in New Mexico, there's not many other options. It's either pecans or, in some areas, pistachios, but not in the -- in the area in the -- around Las Cruces. So identify pecan orchards with satellite images and then I -- I chose those that had medium to light size and then I selected those and then looked at which one we

could access along the river. I need to be excused for just one minute.

Page 00018

(Exhibit No. 2 was marked.)

Q. (BY MR. DRAPER) We've been talking a bit about your -- your work that's described in -- in the report. And in the first page of the report, you -- you state your general conclusion indicated by four bullet points. If I read this correctly, the first two conclusions that you state there in your summary, they relate to surface water quality, correct?

A. That is correct.

Q. And they generally state that although the quality degrades going downstream, the overall quality of the surface water is fairly good, right?

A. Correct.

Q. And it's good enough for pecans, correct?

A. Certainly. Yeah, if it's good enough for pecans, it's good for many of the crops, because pecan is considered sensitive to -- to water -- lower water

Page 00019

quality, especially salinity so...

Page 00019

Q. And in your last conclusion there at the top of Page 2, you conclude that there are no visual symptoms of salinity damage to the trees that you surveyed, correct?

A. That's right.

Page 00020

Q. In looking at the second paragraph there on -- at the bottom there of Page 9, second paragraph

in Section 3.7, if I read that correctly, you're saying that there is no consensus about what the salinity threshold is for pecans; is that correct?

A. That's right.

Q. And you indicate that that's not surprising because there are a number of variables that -- that affect yield, correct?

A. That's right. So basically, you cannot find the -- like, a one-size-fits-all or, like, a temperature, like a 99.6. That's pretty much true for everybody. You cannot do the same for -- for salinity. There's too many variables that you cannot just, oh, that's definitely the threshold.

Q. And what are the major variables? I think you mentioned them in the paragraph there, but could you just list some of the major variables?

A. Yeah, absolutely. Some of the research was

Page 00021

done on young trees, seedlings, you know, three, four years of age. You obviously have to look at the soil because a well-drained soil allows the -- the salts to leach down deeper profiles, and also the frequency of irrigation. So if you keep watering, then the salts move -- move -- would move lower to -- to, you know, deeper soil layers, so they become unaccessible to plants. They're not only the frequency of irrigation but also the amount of water you irrigate each time because the more you irrigate, the more you leach. The varieties, that's another variable. The root stalk. All pecan trees are grafted, so you can use some root stalks that are more tolerant to salinity

than others so obviously all this act concurrently, not even alone, so you understand that becomes a pretty complex equation. But you can certainly identify a range. Okay. You might not be able to pinpoint exact number of salt in water, but you can certainly say, okay, between this and that, you know, you definitely start seeing -- experiencing some problems.

Q. And you conclude your discussion, which appears at the top of Page 10, by saying that, "Miyamoto 1986 suggested that the soil salinity, ECe threshold should be 2 decisiemens per meter in the

Page 00022

upper 30 centimeters of soil and -- I'm sorry 2 decisiemens per meter in the upper 30 centimeters of soil and three decisiemens per meter for the 0 to 60 centimeters," correct?

A. That's right. So that's one particular study, but if you keep reading, other studies did not find values -- damages at those values, but they did find it at high values. So as I say, it's a range.

Q. All right. Yes, let me just read that next sentence that you have, which is, "However, other studies, Deb et al 2013, Picchiono et al 1991, did not measure negative effects on tree performance at these levels, suggesting that the values reporting by Miyamoto et al 1986, may be at the lower end of the salinity spectrum recommended for pecan trees."

Page 00022

Q. I wanted to check with you. I looked at the

Page 00023

1991 study, and I wondered if you were actually referring to the 2000 study. Let me show you. I have -- I have the 2000 here, and I also have the 1991 so we can take a look. We'll mark that as Exhibit LL-3.

(Exhibit No. 3 was marked.)

Q. (BY MR. DRAPER) Do you see that on your screen?

A. I see that.

Q. All right. Could you scroll down to the table that -- in that report that shows the yield data in relation to the soil salinity?

A. Table 2?

Q. I think it's Table 2.

A. Uh-huh.

Q. That's -- that's it. This is a table that lists various results and -- and as I read it, you have your yield in the second column from the left in the terms of kilograms per hectare.

A. Right.

Q. Over about in the middle of the table, you have the soil salinity, which is marked as -

A. EC.

Q. -- sub E, correct?

A. That's right.

Page 00024

Q. So you have -- if you go down that column under that designation, you see values increasing from 0.5 at the top down to 3 -- the highest is 3.7 near the bottom of the table?

A. That's right.

Q. And so as you go down that column, you're -- you're seeing greater and greater soil salinity. Is that -- would that be right?
A. That's correct.
Q. Okay. And if -- if we then look over at the yield column, the second from the left, the numbers that show the -- the yield as the -- as the soil salinity increases, except for one value, I would say those -- those stayed pretty constant, may even go up a little bit. Would you agree?
A. Yeah, I agree.
Q. So that when you get down to a soil salinity ECe value of even the highest of 3.7, we're not seeing any drop off in yield, are we?
A. That's right.

Page 00025

Q. Could you scroll through that, and once you've done that, tell me if --
A. Yeah, you're right. That's definitely the other one that I should have cited. 2000.
Q. Okay. So that -- that should be a reference to Picchiono 2000?
A. 2000. Et al 2000.
Q. Yeah.
A. Good catch. You should be in academia.
Q. Thank you very much. I take that as a great compliment. So let's go back to the 2000 one then and

Page 00026

that Table 3. So you indicated that Miyamoto's value, which was either two or three decisiemens per meter, may be at the lower end of the spectrum? In other

words, if I understand you correctly, if you -- talking about the salinity threshold where you begin to see a drop off in yield, setting that at two or three, maybe a little too low, because you're seeing values 3.5 even higher --

A. Yeah. Unless in those particular conditions, yeah, they did not affect yield.

Page 00033

Q. Okay. We've marked that as Exhibit 7.

(Exhibit No. 7 was marked.)

Q. (BY MR. DRAPER) In that report, as you may recall, there was a section on the recommended salinity threshold for pecans, and it's back on Page 15 of that report. Now, if you could turn to Page 15,

Page 00034

and that continues on the next couple of pages and finishes on Page 17. This is a section where Dr. Munk reviews the studies on the thresholds by Miyamoto and others like our friend Picchiono and comes to a conclusion about that. I wanted to ask you about that, but before I do, I think it would be interesting, if we go back to Page 14 just before this, there's a graph, Figure 4, which is captioned, "Pecan yield and soil salinity in Dona Ana County, NM, adapted from Picchiono, et al, 2000." This is a graph of ECe along the X axis and the pecan yields in pounds per acre going up the Y axis. Do you recognize this as the data that was in the Picchiono table that we looked at?

A. Yeah. I believe it's -- it's formatted differently. I believe it was a table in Picchiono,

and this is converting to a chart that Dr. Munk did, if I'm not wrong.

Q. Yes. We could go back to that and just take a quick look. That is deposition Exhibit 3, and we were looking at -- I think it was --

A. Yeah. It's probably the table we were looking at earlier. Yeah, it's the Table 2 that we were looking at earlier. I believe that's the one.

Q. Table 2. And that's -- those are actually

Page 00035

the data points that are plotted?

A. Right.

Page 00035

Q. Okay. And then going forward here to the next pages -- next page is the one where this section, as you have on the screen, 3.5, goes through those sources and reaches the conclusion that Miyamoto's may be somewhat low and that he would recommend using 3.5 decisiemens per meter for evaluation purposes if irrigation applications account for a leaching requirement. In reviewing that section in that

Page 00036

conclusion, did you have any -- did you have any strong disagreements with anything there?

A. No.

Page 00036

Q. (BY MR. DRAPER) Doctor, if you'd answer, please.

A. I would say no. I think that kind of agrees with what I was saying earlier that 2.0 might be a little bit of a low threshold, but, again, it depends

on the age of the trees and many other factors.

Q. Those factors include the amount of irrigation and whether --

A. Irrigation, sulfur and frequency of irrigation.

Page 00042

Q. Thank you. Now, we were on Page 39 of your report. Let's go back to your report but a couple pages later, Page 41. This is a page where you have the title for your conclusions section, Section No. 7, and those are stated there at the bottom of Page 41

Page 00043

and running over on to Page 42 at the top. And I wanted to ask you about -- about a couple of aspects there. In the second paragraph, you talk about the worsening of quality and samples collected from surface water, that they did not follow a gradient along the river, but instead drastically worsened in the Texas collection sites.

A. Uh-huh.

Q. Correct?

A. Correct.

Q. That area referring to the surface water quality?

A. That's right.

Q. And then your final sentence on the page says, "The sudden worsening of -- of river water quality in Texas is probably caused by increased municipal use and reclaimed municipal effluent or agricultural return flow via drains."

A. Uh-huh.

Q. And by saying which is known to have higher TDS than surface water in part due to the evapotranspiration of the applied water. So the -- the opinion you're expressing there is that this worsening of water quality in the surface water suddenly in Texas is, in your opinion, probably due to

Page 00044

the -- the municipal effluent flows and the local drain flows, correct?

A. That's right.

Q. The ones that are occurring there in -- in the El Paso area in the --

A. Definitely a big jump after south of -- or at least downstream from the El Paso Cuidad/Juarez metropolitan area.

Q. Downstream from -- from the gage there at -- at the Courchesne bridge?

A. Uh-huh.

Q. That area?

A. That's correct.

Q. But you conclude there that the -- in the final sentence of that paragraph, "Despite the worsening of the quality of surface water measured in Texas compared to New Mexico, overall, the quality of this water was actually good."

A. Yes. In 2019, it was good irrigation water -- surface water, again, we're talking about.

Q. Okay. And, now, you -- you then go on in your final paragraph. You say, "Despite the high salinity levels detected in well water, none of the trees grown in the surveyed orchards showed visual

symptoms of salinity -related toxicity." Correct?

Page 00045

A. Correct.

Q. So you -- you were seeing no -- no signs of negative salinity effects on pecan trees, either in New Mexico or -- or in Texas?

A. We are correct. In 2019, obviously, for what I could see, there were no damages visual, and the -- the leaf analysis results confirmed the levels of sodium where acceptable.

Q. So it was not only the visual inspection you did, but that -- the conclusion was confirmed by the lab tests on leaves?

A. Right.

Page 00052

Q. And isn't it true that the -- the health of the leaf -- of the leaves, in a sense integrates the experience of the -- of the pecan tree during that growing season, what's happened to it since the beginning, and -- and led to its current condition; is that --

A. Yeah, absolutely. It's almost like a -- you know, a -- measuring, you know, pulse or pressure or -- or, you know, everything that happens in the leaf is a good example of what's happening in the tree.

Q. So you were saying at the beginning this morning that you would have preferred to do sampling over a period of years on some of the soil samples that -- and water samples that you took because those were just snapshots, but with respect to the leaf

health, that's a bit more than a snapshot, isn't it?

Page 00053

It's an integration of what's happened in the whole growing season up to that point?

A. Yeah. When I say snapshot, I didn't mean that particular day, but more that particular growing season. So it's a yearly snapshot. That's what I meant.

Q. Okay.

A. It's a good integration because whatever parameters led -- growing conditions led to the leaf up to that point, they are summarized represented in the leaf.