

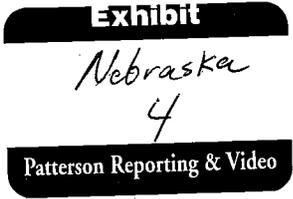
1 NON-BINDING ARBITRATION INITIATED 10/21/08
 2 PURSUANT TO
 3 DECREE OF MAY 19, 2003, 538 U.S. 720
 4 KANSAS V. NEBRASKA & COLORADO
 5 NO. 126, ORIG, U.S. SUPREME COURT
 6
 7
 8
 9
 10

11 DEPOSITION OF TERRY KASTENS,
 12 produced, sworn, and examined on Tuesday, the 24th
 13 day of February, 2009, between the hours of 8:00
 14 o'clock in the forenoon and 6:00 o'clock in the
 15 afternoon of that day at Husch Blackwell Sanders LLP,
 4801 Main Street, in the City of Kansas City, County
 of Jackson, State of Missouri, before:

16 JANE A. BLACKERBY, RPR, CCR
 Registered Professional Reporter
 of
 17 JAY E. SUDDRETH & ASSOCIATES, INC.
 Suite 100
 18 10104 West 105th Street
 Overland Park, Kansas 66212-5755

19 a Certified Court Reporter within and for the State
 20 of Missouri.

21 Taken on behalf of the State of Nebraska.
 22
 23
 24
 25
 26



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1 TERRY KASTENS,

2 of lawful age, having been first duly sworn to tell
3 the truth, the whole truth, and nothing but the
4 truth, testified as follows:

5 DIRECT EXAMINATION

6 BY MR. WILMOTH:

7 Q. Good morning, Mr. Kastens. As you might
8 have heard a moment ago, my name is Tom Wilmoth.
9 I'm with the law firm of Husch Blackwell Sanders,
10 and I represent the state of Nebraska in this
11 case. I appreciate your appearing for your
12 deposition today. We're here to talk about, in
13 principal, a report which I will hand you entitled
14 Economic Impacts on Kansas of Diminished Surface
15 Water Supplies to the Lower Republican River Basin
16 Caused by Nebraska in 2005 and 2006. This will be
17 Exhibit No. 20 to the deposition set.

18 (Whereupon, Kastens Deposition Exhibit
19 Number 20 was marked for
20 identification by the reporter.)

21 Q. (By Mr. Wilmoth) Forgive me for
22 occasionally throwing things at you across this
23 big table.

24 MR. DRAPER: This is Exhibit
25 No. 20?

26

1 MR. WILMOTH: Yes. We're picking up
2 where we left off yesterday, which will prevent us
3 from having multiples of 1, 2, 3.

4 Q. (By Mr. Wilmoth) Mr. Kastens, is there
5 any reason that you can't testify today truthfully
6 and honestly, anything that we need to know about?

7 A. No.

8 Q. Okay. Thank you. What's your
9 educational background?

10 A. Bachelor's degree in Economics at University
11 of Kansas back in 1973. Ph.D. in Ag Economics in
12 1995 from Kansas State University.

13 Q. And what is your current position?

14 A. Professor, Kansas State University,
15 Department of Ag Economics.

16 Q. And you teach what courses?

17 A. I don't teach any courses.

18 Q. Are you a professor in residence or what
19 do you do in your course of work?

20 A. Extension.

21 Q. And what does that work typically
22 entail?

23 A. Extension involves working with business
24 people around the state and around the nation,
25 farmers, educational. Educational about ag economics

1 issues.

2 Q. And are you currently under contract to
3 the state of Kansas?

4 A. That's correct.

5 Q. And what's the scope of that employment?

6 A. I'm sorry, I don't understand the question.

7 Q. What is the scope of that employment?

8 A. For my involvement here? Or I'm not
9 understanding. I'm employed by the state of Kansas
10 as a professor, or is that what you meant?

11 Q. Are you consulting with the state of
12 Kansas on the Republican River matters?

13 A. Yes.

14 Q. And what is the scope of that effort?

15 A. The scope is this project you see here as
16 exhibit.

17 Q. Exhibit 20?

18 A. Yes.

19 Q. What other work are you conducting for
20 the state of Kansas besides the ag extension work?

21 A. That's all.

22 Q. Approximately how many projects have you
23 been involved in that have estimated damages
24 associated with lost irrigation water?

25 A. I believe one.

26

1 Q. This project?

2 A. This current project. I will elaborate a
3 little bit. We work with the economics of irrigation
4 water all the time with farmers. That's -- so yes, I
5 mean, as far as a project, an official project. I'm
6 trying to think.

7 Q. One time for purposes of calculating a
8 damage figure?

9 A. Yeah. Yes.

10 Q. Okay. Do you regularly work with
11 economic models?

12 A. Yes.

13 Q. In what context?

14 A. Research, decision making at the farm level.
15 Predicting. Prediction, I guess.

16 Q. Prediction of what?

17 A. Prediction of behavior. Whether it's -- or
18 crop yields.

19 Q. On the former, with regard to behavior,
20 what does that refer to?

21 A. It would be standard supply/demand kind of
22 models in economics, where you're predicting
23 quantities or prices of items.

24 Q. So when you say behavior, you're
25 referring to behavior of marketplaces?

26

1 A. Yes.

2 Q. Not behavior of individuals?

3 A. Both.

4 Q. Would that include the behavior of a
5 farmer who faces a water short year?

6 A. Yes.

7 Q. Would that include market behavior in
8 response to constricted supplies or demands?

9 A. Yes.

10 Q. So you mentioned behavior. The other
11 thing you mentioned was crop yields. In what
12 context are you using models to predict crop
13 yields?

14 A. In the context of conditional upon input
15 levels, such as fertilizer, irrigation water.

16 Q. Can you identify any projects
17 specifically that you're working on in that
18 context?

19 A. Not official projects, but I have been so
20 much on one-on-one kind of basis and so much. Should
21 note that I'm also a farmer, and so we do tease
22 things all the time. So I don't know exactly. I
23 don't have any particular projects I'm working on at
24 the moment in that sense.

25 Q. Are you working on any projects

26

1 involving crop yields relative to the crop
2 insurance program?

3 A. We have, yes.

4 Q. In what context?

5 A. In the context of limited irrigation and
6 expected yields, expected crop yields from that.

7 Q. What have those models shown you?

8 A. They show that -- well, they show you, first
9 of all, that they depend heavily on the timing of the
10 water, and so the actual response varies dramatically
11 with the timing. Not just the quantity, but rather
12 the timing of the water.

13 Q. When you say response, what do you refer
14 to?

15 A. Yield response to water, how much yield
16 response to irrigation water.

17 Q. When you say that response depends on
18 the timing, what does that mean?

19 A. There's a difference between, if you have
20 limited water, there is a difference if you have
21 limited capacity versus limited total quantity, but
22 the ability to put it on, to keep up with
23 evapotranspiration, I guess is the way I would say
24 it. If you have all the water you need when the crop
25 needs it in the critical time periods, that's not as

26

1 harmful as if you have timing problems, where you're
2 short of water during critical time periods, let's
3 say.

4 Q. When you say all the water the crop
5 needs, I assume that it does not matter where the
6 source of the water, what the source of the water
7 is?

8 A. That would be correct.

9 Q. Have you identified any relationship
10 between crop yields and irrigation water in the
11 context of federal or state crop insurance
12 programs?

13 A. I don't know if we determined it or not. We
14 have argued about it plenty. Generally it ends up --
15 we end up working with quadratic kind of response.
16 Just a curve response is where it usually ends up
17 after you argue about the functional form.

18 Q. What is a curve response in a functional
19 form?

20 A. I'm sorry.

21 Q. What is a --

22 A. Diminishing returns to -- the first inch of
23 water gets you more yield than the last inch.

24 Q. So in your research regarding crop
25 insurance, are you saying that there's a linear
26

1 relationship between irrigation and water
2 availability and yield?

3 A. No.

4 Q. What is the relationship?

5 A. Curvilinear.

6 Q. So the more water you have at a certain
7 point, the less yield?

8 A. Repeat that question.

9 Q. The more water you have at a certain
10 point, the less yield you get per inch?

11 A. Yes.

12 Q. That's your concept of diminishing
13 returns. Correct?

14 A. Yes.

15 Q. Do you possess any documentation of
16 these efforts?

17 A. Not that I can think of right at the moment.

18 Q. You don't have any model runs or
19 anything that you're working on in the crop
20 insurance field?

21 A. I'm sure there's countless model runs on my
22 computer somewhere. Haven't done anything for
23 probably a year or thereabouts.

24 Q. Is your model publicly available?

25 A. No, I don't think so.

26

1 Q. Is your model proprietary?

2 A. I haven't thought about it.

3 Q. Can we access your model?

4 A. There is no set model. So I mean, I don't
5 know what you would be accessing, I guess. Are you
6 talking -- unless you're talking about the model
7 that's in use in here.

8 Q. No. What I'm talking about is the model
9 that you're currently using to develop
10 relationships between irrigation water available
11 and crop yields for the crop insurance program.

12 A. I don't know if publicly available or not.
13 I don't even remember exactly what we did. We wrote
14 a little white paper for somebody and that's about
15 all I recall.

16 Q. So there exists a white paper that --

17 A. That would be my recollection.

18 Q. -- that provides your conclusions? Do
19 you possess a copy of that white paper?

20 A. Not with me.

21 Q. Do you recall for whom that white paper
22 was prepared?

23 A. No.

24 Q. Did you work with anyone else on that
25 white paper?

26

1 A. Yes.

2 Q. Whom?

3 A. Bill Golden, Kevin Dhuyvetter, Paul Clark,
4 Leah Suttle. I think that's about it.

5 Q. Do you know if Mr. Golden possesses a
6 copy of that paper?

7 A. I don't know.

8 Q. Were you the primary author of that
9 paper?

10 A. I don't think so.

11 Q. Was Mr. Golden the primary author?

12 A. I don't know.

13 Q. Do you know approximately how long ago
14 that paper was prepared?

15 A. I assume a year.

16 Q. Do you recall the general conclusions of
17 that paper?

18 A. No.

19 Q. What was your involvement in preparing
20 the paper?

21 A. Modeling, I guess. Spreadsheet work.

22 Q. So you generated the modeling one year
23 ago, but you don't recall any of the conclusions?

24 A. I don't remember -- I remember arguing a lot
25 about the response to water.

26

1 Q. What did you argue about?

2 A. We argued about the response and whether it
3 was linear and whether it was curvilinear and then
4 the nature of the curvilinear response.

5 Q. What was the nature of the curvilinear
6 response, as you recall?

7 A. The nature of the curvilinear response, I'm
8 trying to think the best way to answer that.
9 Depending upon the timing of water, the curvilinear
10 response can start steeper and end up flatter the
11 more water you have, I think is probably the best way
12 to say it.

13 Q. Could you please illustrate what you
14 mean by that? And we'll mark this as Exhibit 21.

15 A. You want me to illustrate?

16 Q. Illustrate the response you just
17 described that begins steeper and levels out
18 later, if that is your recollection. I'm not
19 suggesting how to draw it for you.

20 Thank you. Mr. Kastens, do these two --
21 actually, let me back up. Please mark that as
22 Exhibit 21.

23 (Whereupon, Kastens Deposition Exhibit
24 Number 21 was marked for
25 identification by the reporter.)

26

1 Q. (By Mr. Wilmoth) Mr. Kastens, do those
2 two figures represent the source of the argument
3 that you were referring to? In other words, were
4 you arguing about which of those was accurate?

5 A. Yes.

6 Q. And which one did you believe was
7 accurate?

8 A. The bottom one, the curvilinear one.

9 Q. And what was the response in argument
10 for the linear, more linear response?

11 A. I'm sorry?

12 Q. What did you argue about?

13 A. The shape of the response. We argued about
14 everything. We argued about the response early on at
15 low inches. We argued about the response at high
16 inches. We argued about the linearity versus the
17 nonlinearity, the degree of nonlinearity, and the
18 issue always comes down to timing. If you can time
19 the water extremely well, then the curvilinear
20 response goes up faster and then flattens out
21 quicker.

22 Q. In layperson's terms, would that mean
23 that there was a less direct relationship between
24 the availability of water and yield?

25 A. What do you mean by less direct?
26

1 Q. Or a more direct relationship? In other
2 words, was the availability of water more or less
3 important?

4 A. Than what?

5 Q. Under one of those scenarios or the
6 other.

7 A. Well, availability is more important in the
8 curvilinear.

9 Q. So, in other words -- strike that.

10 The converse then would be that water
11 availability is less important in the figure on
12 the top?

13 A. That's correct. Water timing.

14 Q. Water timing. And do you recall at the
15 end of your arguments which of those was selected
16 as the preferred conclusion?

17 A. I don't know that. Selected by?

18 Q. In the white paper.

19 A. Oh. My best recollection, it would be the
20 bottom one, the curvilinear one.

21 Q. Is the debate about these two things
22 articulated in the white paper?

23 A. I don't remember, actually. I would presume
24 so.

25 Q. Do you remember the title of the white
26

1 paper?

2 A. No.

3 Q. Thank you very much. Let's turn back to
4 Exhibit 20, which is the -- what I will call the
5 economic report for shorthand purposes. What role
6 did you play in producing this report?

7 A. Part of the team that discussed the issues
8 and worked up the models on the direct impact side of
9 the report.

10 Q. When you say worked up the model, does
11 that mean created it or ran it or both?

12 A. Both.

13 Q. So essentially, you are responsible for
14 the modeling in the report?

15 A. The team was, and so I don't know that --
16 well, the team was.

17 Q. With whom did you discuss the report and
18 its conclusions as you were preparing?

19 A. With whom did I discuss it? Oh, primarily
20 the team members. Golden, Dhuyvetter and
21 Featherstone more so than with Leatherman and
22 Johnson, who were doing more of the indirect effects
23 of the paper.

24 Q. Did you discuss the issues or
25 conclusions in the paper with anyone else?

26

1 A. Not that I know of.

2 Q. What about Mr. Book?

3 A. Oh, well, yes, I'm sure we have discussed it
4 with Mr. Book.

5 Q. Where did you obtain the inputs for the
6 water volumes that are referenced in the paper?

7 A. From Book's.

8 Q. Did you discuss those with Mr. Book or
9 did you just read his report?

10 A. I would say minimal discussion. Mostly just
11 reading the report.

12 Q. Do you have any unresolved questions
13 about those water volumes or how Mr. Book derived
14 them?

15 A. No.

16 Q. Do you have any unresolved questions
17 about the critical inputs or assumptions that you
18 make in your report?

19 A. No.

20 Q. Did you ever contact or confer with any
21 members of the Kansas-Bostwick Irrigation
22 District?

23 A. Yes.

24 Q. With whom did you discuss it?

25 A. I don't recall the names.

26

1 Q. Do you recall what you discussed?

2 A. We discussed the -- I think really broadly
3 how they operate, how they deliver water. Drove
4 around in the Bostwick area, drove to Lovewell. Kind
5 of got a feel for how they operate, I guess, more
6 than anything.

7 Q. Did you learn anything during the course
8 of that effort that assisted your report
9 preparation?

10 A. Well, yes.

11 Q. What was that?

12 A. Oh, that there exists some reports that we
13 can draw from to get information about prices and
14 crop yields and irrigation technology, those sorts of
15 things.

16 Q. Are those KBID reports?

17 A. Yes.

18 Q. How about Mr. Ross, Scott Ross from the
19 state of Kansas, did you confer with Mr. Ross?

20 A. Yes.

21 Q. Regarding?

22 A. Regarding the Bostwick District, I guess how
23 it functions.

24 Q. Did you form any independent concludes
25 about how Bostwick functions?

26

1 A. Independent from?

2 Q. Independent from the information you
3 obtained from KBID or from Mr. Ross.

4 A. No.

5 Q. So do you have any reason to question
6 the analysis conducted by Mr. Book?

7 A. No, I don't.

8 Q. And am I correct in understanding that
9 the economic report assumes the validity of
10 Mr. Book's report?

11 A. Yes.

12 Q. And if Mr. Book's report contains some
13 errors, the fundamental input, namely the water
14 volumes, that are used in your report would
15 change. Do you understand that?

16 A. Yes.

17 Q. How would that affect your report, if
18 those volumes were decreased?

19 A. If they were decreased, the dollar amounts
20 would typically go down.

21 Q. Do you believe that would be generally a
22 linear relationship?

23 A. No.

24 Q. Please explain why.

25 A. Explain why? Because by the time you work

26

1 with the water response model and all the economics
2 that we have done it, there's a lot of non-linear
3 things that can place it with -- no, mostly because
4 of the non-linear response to water.

5 Q. So, for example, if the number were
6 decreased by 10,000 acre feet, do you have any
7 sense as to how that might affect your report?

8 A. My sense would be that the value per acre
9 foot would go up. The total dollars would go down.
10 Beyond that, I don't know without working with the
11 model.

12 Q. You don't have any sense as to the
13 magnitude of either of those issues on a rough
14 percentage basis?

15 A. No. Really, I don't.

16 Q. Any idea if it would be more than
17 10 percent?

18 A. I'm sorry.

19 Q. Would it be more than 10 percent?

20 A. If the water -- if water quantities drop
21 from what to what?

22 Q. If the water quantity were decreased by
23 10,000 acre feet.

24 A. At the state line, at the farm level or --

25 Q. At the state line.

1 A. At the state line, if we -- are you talking
2 about the state line water, the 70-some thousand acre
3 feet number? Is that the one you're thinking about?

4 Q. Correct.

5 A. And it dropped ten?

6 Q. Correct.

7 A. It would be about a 13 percent drop in water
8 quantity. No, I can't answer that. The numbers
9 you're giving me are too close to make that call.

10 Q. Okay. I note on page, small Roman 3,
11 the executive summary.

12 A. Small Roman 3.

13 Q. Of your economic report. This is the
14 executive summary.

15 A. Just the executive summary in general.

16 Okay. Got it.

17 Q. The second to the last paragraph
18 indicates, if you will allow me to read it for
19 sake of convenience, "As such, our study relied on
20 models of crop yield response to irrigation
21 water." Do you see that reference?

22 A. Yes.

23 Q. And then subsequently, on Page 2 of the
24 actual report, under heading A. Water Response
25 Functions, the second sentence of that paragraph

1 appears to read, "As such, our study fundamentally
2 depended upon models of crop yield response to
3 irrigation water." Is that accurate?

4 A. Yes.

5 Q. Did I accurately capture that?

6 A. Yes.

7 Q. Could you explain what that means?

8 A. It's what we've been talking about. How
9 does yield -- how does each incremental inch of
10 additional water or reduced water impact the change
11 in yield, change in crop yield in an expectation
12 framework.

13 Q. And so is it accurate to say that this
14 report is based on modeled expectations?

15 A. Yes.

16 Q. Did you conduct any real world analysis
17 to truth test those expectations?

18 A. No.

19 Q. There's an assumption in your report on
20 Page 1 that indicates under economic impacts
21 associated with reduced water supplies. Do you
22 see that --

23 A. Yes.

24 Q. -- heading?

25 A. Yes.

26

1 Q. The statement appears, "When
2 agricultural water use is restricted, crop
3 production, in all likelihood, will be reduced and
4 producers and local communities will incur
5 negative economic impacts." Did I accurately
6 capture that?

7 A. Yes.

8 Q. Is that premise tested in any way in
9 this report?

10 A. I'm not sure what you mean by tested.

11 Q. On what basis did you make that
12 conclusion?

13 A. On the basis of the changing response to
14 irrigation water and the economics that flows from
15 that.

16 Q. Did you discuss that assumption with
17 anyone in KBID?

18 A. I don't remember whether we discussed that
19 specific assumption. I mean --

20 Q. Is it possible that yields do not
21 necessarily go down with limited water
22 availability?

23 A. It's possible. That's not expected. It's
24 possible.

25 Q. Under what conditions would that be
26

1 possible?

2 A. If you had excess rain and irrigation
3 weather actually caused agronomic problems with crop
4 yields.

5 Q. So if I'm understanding you correctly,
6 some source of substitute supply could essentially
7 mitigate the lack of irrigation water?

8 A. It could.

9 Q. Correct?

10 A. Yes.

11 Q. To what extent did you analyze the
12 availability of substitute supplies in or outside
13 of KBID?

14 A. We explicitly bring in rainfall into the
15 model.

16 Q. Did you evaluate whether groundwater
17 pumping could offset these negative impacts?

18 A. No.

19 Q. Did you evaluate whether the recapture
20 of surface flows, waste flows, if you will, could
21 be utilized to mitigate those impacts?

22 A. No.

23 Q. Could both of those things act as
24 mitigators of the lack of water supply?

25 A. Yes.

26

1 Q. About halfway down on Page 1 you list a
2 series of factors, and I'll just indicate that the
3 passage begins, "The magnitude of the economic
4 impact depends on several factors." Do you see
5 that --

6 A. Yes.

7 Q. -- assumption? I would like to walk
8 through each one of those briefly. With regard to
9 the first one, could you identify that?

10 A. The magnitude of the water use reduction?

11 Q. Yes. Do I understand correctly that in
12 determining that number you relied solely on the
13 Book report?

14 A. Yes.

15 Q. With regard to No. 2, could you identify
16 that?

17 A. The current level of water use efficiency in
18 the production process.

19 Q. Could you articulate what you relied on
20 for that figure?

21 A. It would be the -- well, again, the Book
22 report.

23 Q. I could not locate water use
24 efficiencies of 65 percent or 90 percent in the
25 Book report. Can you do that as we sit here

1 today?

2 A. I don't understand what -- well, those are
3 two totally different efficiency numbers. You're
4 referencing the application efficiency of water at
5 the field level, the stuff we use, and that's a
6 different number than the numbers we're talking about
7 in canal losses and so forth.

8 Q. So the Book report was used for
9 essentially canal losses?

10 A. To give us amount of water at that farm head
11 gate, yes.

12 Q. And where did your 65 and 90 percent
13 numbers come from?

14 A. It came from -- we cited in the paper,
15 there's three reports that came from. Probably,
16 also, I'm trying to think whether there was any
17 specific times talking to irrigation engineers and so
18 forth. I don't have anything more concrete than
19 that.

20 Q. You indicated earlier that you're a
21 farmer. Is that correct?

22 A. That's correct.

23 Q. Where do you farm?

24 A. Northwestern Kansas.

25 Q. What are your efficiencies?

26

1 A. I assume to be that with center pivot, 90,
2 95 application efficiency. Depends on which
3 efficiency you want to talk about.

4 Q. And you use center pivot irrigation?

5 A. Yes.

6 Q. What about factor No. 3, what is that?

7 A. The number of acres involved, which would
8 be -- the number of acres involved, the number of
9 acres irrigated, the number of acres not irrigated.

10 Q. Okay. And where does that information
11 came from?

12 A. That came from KBID's reports.

13 Q. What about factor No. 4?

14 A. Precipitation that occurred during the
15 period.

16 Q. And that information came from?

17 A. The KBID reports.

18 Q. You mentioned earlier that it was
19 important that water come at a certain time of
20 year. That's based in part on your experience as
21 a farmer, I assume?

22 A. Yes.

23 Q. When is the water most critical for,
24 say, corn?

25 A. In July typically.

1 Q. What's the next most significant month?

2 A. August.

3 Q. As a farmer, when do you typically make
4 your planting decisions?

5 A. Early in the year. Between January and
6 February generally.

7 Q. You buy your fertilizer then?

8 A. Typically, yes.

9 Q. You determine your crop mix then?

10 A. Yes.

11 Q. Is your farm located in an irrigation
12 district?

13 A. No.

14 Q. Do you divert natural stream flow?

15 A. No.

16 Q. Do you pump groundwater wells?

17 A. Groundwater wells.

18 Q. Would you identify factor No. 5 and
19 explain that.

20 A. The crop mix for the area?

21 Q. Yes.

22 A. The percentages of the different crops that
23 would be planted.

24 Q. So how much corn versus how much --

25 A. Yes.

26

1 Q. And you obtained that information from?

2 A. On the irrigated, from KBID. On the acres
3 that could not be irrigated, we assumed the acreage
4 from either -- from the Kansas statistics from the
5 area.

6 Q. How about the sixth factor?

7 A. No. 6 is crop yields that depend on crop
8 specific production functions.

9 Q. Could you describe what a crop specific
10 production function is?

11 A. Meaning that the response to water is
12 different by crop.

13 Q. So for corn, what is the crop production
14 function you relied on?

15 A. I don't know what you're asking me.

16 Q. Well, I'm asking you what you did to
17 determine the crop specific production function
18 for corn.

19 A. We started with the Stone model and
20 calibrated it in a manner to get at so that it would
21 economically predict what we determined to be the
22 trend yield and then you have got the function set.

23 Q. Is that function a number?

24 A. No.

25 Q. It's a relationship?

26

- 1 A. Yes.
- 2 Q. Can you explain the relationship?
- 3 A. It's quadratic. Diminishing returns.
- 4 Quadratic plateau in that it peaks.
- 5 Q. Peaks at what point?
- 6 A. At what we referred to as the yield goal.
- 7 Q. Which is what?
- 8 A. Yield goal is the expected yield given that,
- 9 in our case, given that irrigation water and nitrogen
- 10 were free. Basically nonlimiting.
- 11 Q. In your experience, how often are
- 12 irrigation water or nitrogen free?
- 13 A. Never.
- 14 Q. What about No. 7?
- 15 A. Prices and costs.
- 16 Q. Prices of what?
- 17 A. Crop prices, fertilizer prices, fuel prices
- 18 to get at irrigation costs and then various other
- 19 costs associated with operating a farm.
- 20 Q. So prices does not mean corn prices or
- 21 crop prices?
- 22 A. Those are also both output and input prices.
- 23 Q. Output and input prices?
- 24 A. Yes.
- 25 Q. Okay. And you obtain that data

1 generally from where?

2 A. The crop prices were obtained from the KBID
3 reports. The fertilizer prices, I don't even
4 remember exactly. I can find it here in a footnote.
5 It was from USDA numbers, and the other costs of
6 operating a farm or coming from the Kansas -- I'm
7 sorry, the K State farm management budgets.

8 Q. Okay. In order to determine the water
9 response functions you referred to, did you rely
10 on something called the IPY-sim model?

11 A. Yes.

12 Q. For the court reporter's information,
13 capital I, capital P, capital Y small s-i-m. Can
14 you explain what the IPY-sim model is?

15 A. It's a model we developed, spreadsheet model
16 that builds on the Stone's work, on the quadratic
17 response to water and the quadratic response to
18 nitrogen fertilizer. It is a limiting factor model
19 such that those two are treated -- can be limiting
20 independently, and so you pick what's optimal given,
21 you both have nitrogen costs and irrigation costs,
22 still costs, that's what determines the optimal
23 amount of water that would be applied to make the
24 most money. So it's a model that's basically yield
25 is a response to water, and also, yield is a response

26

1 to fertilizer.

2 Q. And if I understood what you said
3 earlier, the IPY-sim model was used to determine
4 the economically optimal yield. Is that correct?

5 A. Yes.

6 Q. Is that a standard use of the IPY-sim
7 model?

8 A. Yes.

9 Q. To your knowledge, has this model ever
10 been used to calculate damages in a legal
11 proceeding?

12 A. No.

13 Q. What's your opinion of the reliability
14 of the IPY-sim model?

15 A. I guess pretty good.

16 Q. Are there any assumptions in the model
17 that cause you concern as a professional?

18 A. We always debate whether people behave in a
19 truly limiting factor framework where nitrogen's kind
20 of independent of irrigation water. So we always
21 debate certain things, but no, I don't have any
22 significant concerns.

23 Q. I'm sorry, I spoke over you. I
24 apologize.

25 A. I forgot what I said.

26

1 Q. Are you aware of any tools, models that
2 you prefer to use other than IPY-sim for similar
3 purposes?

4 A. No.

5 Q. Is it accurate to say, then, in your
6 policy opinion, IPY-sim is the best tool available
7 for this task?

8 A. Yes.

9 Q. Is this the same model that you used in
10 the white paper we referred to earlier?

11 A. I don't remember whether we did anything in
12 nitrogen on it or not, so I can't answer that.

13 Q. Is there a name for that model that was
14 used in the white paper?

15 A. To tell you the truth, I don't remember.

16 Q. Do you recall how it differs from
17 IPY-sim?

18 A. We didn't use nitrogen. It would differ in
19 that account for sure. Other than that, I don't
20 remember.

21 Q. Regarding your assumption for irrigated
22 crop mix, Page 5, is it accurate that for
23 determining irrigated crop mix you relied on a
24 crop mix that was similar to the period 1994 to
25 2000?

26

1 A. Let me take a look here so I can answer that
2 question.

3 Q. I just direct your attention to the last
4 sentence of that paragraph under Section H.

5 A. Yes.

6 Q. Why was that period selected?

7 A. Because it was believed to be normal years
8 in the sense that water was not short at the start of
9 the season.

10 Q. Do you have any idea how that related to
11 2005 and 2006?

12 A. What are you saying, how that related?

13 Q. In terms of water availability.

14 A. Well, '05 and '06 were water short years.

15 Q. So in contrast to normal water years,
16 those were short years?

17 A. Yes.

18 Q. What about 2004?

19 A. I don't know.

20 Q. What about 2003 or 2002?

21 A. I have assumed that those were water short
22 years.

23 Q. So there were at least three years that
24 were water short years preceding 2005 and 2006.

25 Is that correct?

26

1 A. That's correct.

2 Q. Would that affect irrigators' behavior
3 in 2005 regarding crop mix?

4 A. Would the years in 2000 -- I'm sorry.

5 Q. Would the fact that they faced three
6 consecutive water short years prior to 2005 affect
7 their crop mix?

8 A. I don't know the degree. I don't know how
9 long for sure people expect water to be short.

10 Q. You don't know the degree to which it
11 would affect their behavior?

12 A. The behavior would be affected dramatically
13 if they thought every year to eternity was going to
14 be water short. I don't know when we have years that
15 are water short and years that aren't, I don't know
16 the magnitude in which it changes their behavior.
17 Okay. Yeah, that's probably the best way to say it.

18 Q. Do you think it would be different than
19 a situation in which they were coming off three
20 years of normal years? In other words, let me
21 clarify that. If the period 2003, 2004 and 2002,
22 for that matter, were normal water years, do you
23 think that would be different than if it were
24 water short years?

25 A. Yeah, it would be slightly different.

1 Q. With regard to irrigated crop yield on
2 Page 6, about halfway down that page it appears
3 that you-all relied on an average annual
4 precipitation number. Is that correct?

5 A. That's correct.

6 Q. How did that precipitation number relate
7 to actual precipitation in 2005?

8 A. 2005 was wetter.

9 Q. How did you take that into account in
10 conducting your analysis?

11 A. Well, rainfall is an explicit part of the
12 IPY-sim model, but we handle it through the
13 differences in seasonal rainfall. We wanted to be a
14 little bit more accurate than to try to -- the
15 IPY-sim model depends upon annual precipitation
16 because that is the way Stone developed it, but we
17 believe it would be more accurate yet if we looked at
18 the differences in growing season rainfall, add that
19 back to the normal annual rainfall. We believe it's
20 a better representation of what actually took place.

21 Q. Is that monthly information reflected in
22 this report?

23 A. The seasonal precipitation?

24 Q. The seasonal precipitation.

25 A. Yes.

26

1 Q. Where?

2 A. Table 6.

3 Q. So do I understand you correctly that
4 Table 6 shows that the growing season
5 precipitation for corn is normally 16.73 inches?

6 A. That's correct.

7 Q. And in 2005 it was 20.25 inches?

8 A. That is correct.

9 Q. And how did you account for that in your
10 report?

11 A. Okay. Then we would take that difference,
12 whatever, call it 4 inches or 3 1/2 or whatever it
13 is, and add that back to the 28.22 annual
14 precipitation shown in the same table, and then that
15 provides the annual number we use in the model, and
16 then that determines kind of the amount of
17 substitution you have of rainfall and then determines
18 the amount of irrigation water needed.

19 Q. Do you know when the bulk of that water
20 came in 2005, what month?

21 A. Not right offhand.

22 Q. Did you conduct that analysis?

23 A. No.

24 Q. Did any of the authors conduct that
25 analysis?

26

1 A. Not that I know of.

2 Q. I thought I understood you to testify
3 earlier that the timing of water was critically
4 important for some of these yield curves. Are you
5 suggesting that no one, none of the authors in
6 this report took that into account?

7 A. That is correct. Anytime you're doing
8 modeling, you have to bring out the most salient
9 features, the ones that you believe are the most
10 important to capture what might take place. The
11 finer tuned you do it, you might get way off on
12 something because your model is not designed that
13 way, and so it's a balancing act between broad and
14 narrow.

15 And so no, we did not consider -- let me put
16 it this way. We do not believe there's reliable
17 models at, say, the monthly scale of water. Even
18 though we know that the timing of water impacts
19 probably water response, we don't have reliable
20 models that deal with that, that are out there, nor
21 have we developed reliable models to deal with that,
22 and that would be my reason for saying we didn't do
23 that. We basically just used like Stone's model
24 because we believed it was reasonably reliable.

25 Q. But if the model assumed, for example,
26

1 that there were 31 inches of precipitation in a
2 year, but in actuality 20 of those inches came in
3 July and August, how would that affect yields for
4 corn?

5 A. Well, we captured that looking at seasonal
6 rainfall. We didn't break it down to the individual
7 months because there are other issues that come in,
8 temperatures in those months. There's a lot of other
9 factors that can mess up the finer tuned you do a
10 model, and so we say, well, all right, at the
11 seasonal rainfall level, given we have got soils that
12 are pretty decent water holding capacity, I believe,
13 and so we just did it at the seasonal level. We
14 didn't break it down to the individual models.

15 Q. The report discusses certain indirect
16 economic impacts. Are you familiar with that
17 concept?

18 A. Yes.

19 Q. Did you work on that portion of the
20 report at all?

21 A. No.

22 Q. Do you have any opinion about the issue
23 of indirect effects? Do you have any expert
24 opinion on behalf of the state of Kansas about the
25 issue of indirect economic impacts?

26

1 A. Probably say no.

2 Q. I would refer your attention to

3 Exhibit 21 for a moment.

4 A. Okay.

5 Q. Based on that figure, if you had average

6 or above average rainfall in July, would that

7 result in a faster growth, crop growth and a

8 leveling out of that curve sooner?

9 A. Yes. If -- yes.

10 Q. What kind of yields did you predict

11 using the IPY-sim model in 2005?

12 A. Given -- okay. Given the actual irrigation?

13 We predicted 150.5 corn yield below Lovewell and

14 120.3 above Lovewell in 2005.

15 Q. Do you know what the actual yield was in

16 that year?

17 A. In the area below Lovewell it was 187. We

18 don't know what it was above Lovewell since they

19 never had irrigation water.

20 Q. What does that say about the reliability

21 of the IPY-sim conclusion?

22 A. Like all models, they're inaccurate at the

23 individual point level.

24 Q. Assuming for the sake of argument the

25 accuracy of the 187 number -- is that the number

26

1 you gave?

2 A. Well, 150.5 on the predicted yield?

3 Q. No. The actual.

4 A. The actual 187, yeah.

5 Q. Assuming that 187 were the model number,
6 how would that affect your report?

7 A. It would basically -- you mean the model
8 number at the actual irrigation level?

9 Q. If your 150-some odd number was actually
10 187, how would that affect your analysis?

11 A. Then you would show no waters, no -- no
12 additional water would be needed is what it would
13 show, if I'm understanding your question correctly.

14 Q. That is my question, yes.

15 A. Or less water, I should say.

16 Q. How much less?

17 A. I don't know. I would have to -- I don't
18 know. I'd have to look at the model.

19 MR. WILMOTH: All right. Let's take
20 a five-minute break or let's take ten, actually.
21 Take ten minutes.

22 (Brief recess taken.)

23 MR. WILMOTH: John, we have no
24 further questions. I defer to Mr. Ampe to see if
25 he has anything.

26

1 MR. AMPE: I have no questions for
2 this witness.

3 MR. DRAPER: Okay. Well, let's take
4 another short little break, let me just confer
5 with the witness and we'll be right back.

6 (Brief recess taken.)

7 MR. DRAPER: Okay. I just have a
8 couple of follow-up questions.

9 CROSS-EXAMINATION

10 BY MR. DRAPER:

11 Q. Dr. Kastens, did you calibrate the model
12 that you used in the analysis that is shown in
13 Deposition Exhibit 20, did you calibrate that
14 model to real world data in any way?

15 A. Well, first of all, this is fundamentally
16 based on real world data. The underlying yield
17 response model is on Stone's work, and so it's
18 fundamentally based on that, and because it does
19 bring in explicitly rainfall, it does extend, you
20 know, somewhat away from the area where it was more
21 typically used, the western third of Kansas.

22 And secondly, we calibrated more,
23 specifically to this project was what we referred to
24 as a trend yield, because the technology increases
25 yields over time, we established a trend yield, for
26

1 example, for corn, just use that as an example, for
2 2006, and so we then picked the yield goal, which is
3 the peak of the quadratic plateau, such that the
4 optimal irrigation amount, the optimal yield, if you
5 will, because it goes all together, exactly hits that
6 trend yield in 2006.

7 And so it is calibrated so that it is kind
8 of representative specifically of this area, and then
9 from there, of course, you know, you could calibrate
10 it however far you want down to some individual, but
11 that's the way we do it.

12 Q. Over what period did you calibrate it?

13 A. I believe it's 19 -- 45 years. 1962 to
14 2006, I believe.

15 Q. And my other question is this. I
16 understand that you were not responsible for the
17 detail of the indirect impact analysis, but do you
18 have any general opinions with respect to the
19 propriety of indirect impact analysis and how that
20 analysis was done in this case?

21 A. Well, first of all, they are -- they're very
22 real effects. They're regularly used in welfare kind
23 of analysis, and second of all, even though I didn't
24 get into the nuts and bolts of it, I have a
25 tremendous respect for two of the best regional

1 economists around that I think are on our team to put
2 that together, and so I take it at its face value in
3 that regard. And so I believe that the final number
4 in the report is our best guess of what that number
5 should be, frankly, dollar wise.

6 MR. DRAPER: That's all.

7 MR. WILMOTH: I have some follow-up
8 questions.

9 REDIRECT EXAMINATION

10 BY MR. WILMOTH:

11 Q. Dr. Kastens, you referenced the real
12 world data calibration earlier. I'd like to talk
13 to you about some real world statistics. Do you
14 have any idea what the corn yield was in KBID
15 within 2002?

16 A. Not without looking it up in the
17 spreadsheet.

18 Q. Do you have information available that
19 would help you do that?

20 A. No. None.

21 Q. Have you reviewed Mr. Sunding's report.

22 A. I have begun to review it, yes.

23 Q. Do you have a copy of that report with
24 you?

25 A. No.

26

1 Q. I'm going mark as Exhibit 22 Figure 4
2 from the Sunding report.

3 (Whereupon, Kastens Deposition Exhibit
4 Number 22 was marked for
5 identification by the reporter.)

6 Q. (By Mr. Wilmoth) What does Figure 4
7 reflect?

8 A. Well, it's KBID irrigated corn yields in
9 north central Kansas, probably all corn yields, dry
10 land and irrigated, I imagine.

11 Q. And what does it show the yield was in
12 2002?

13 A. If I'm looking at the right dot. Where does
14 this chart end, at what year? I can count backwards
15 in dots. Is that 2002 dot? Again, can you point me
16 to which dot you want me to look at, or which
17 vertical line so I know what you're talking about?

18 Q. Let the record reflect that I have
19 annotated Exhibit 22 to reflect the years 2001
20 through 2007 individually.

21 A. Okay.

22 MR. WILMOTH: Could you repeat my
23 question, please, for Dr. Kastens.

24 (The requested portion of the record was
25 read by the reporter.)

1 A. A hundred and 60, maybe, give or take some.
2 Looking across, that's what you're asking.

3 Q. (By Mr. Wilmoth) Did you catch that?
4 And what about 2005?

5 A. Okay. Seven, six, five. Well, that would
6 be that 187 number.

7 Q. And so at least since 1970 it appears
8 that in 2005 yields were higher than they had ever
9 been?

10 A. That's correct.

11 Q. Even though less water was delivered in
12 2005 than, say, 2002?

13 A. That's correct.

14 Q. How do you explain that?

15 A. Just the natural variation in factors not
16 explained.

17 Q. Such as?

18 A. Temperatures, temperature, timing of
19 rainfall, all the issues we can't explain. I don't
20 consider it at all unusual.

21 Q. How does your model account for that?

22 A. The model accounts for that by using the
23 proportional differences in the model times the
24 actual observed yield. What you're saying is if you
25 have a particularly good year or particularly bad

26

1 year due to factors not explained in your model,
2 you're better off using the proportional change to
3 get at what it might have been, because if it was
4 really a really poor yield or really good yield, you
5 know, you need to deal with that somehow. So you use
6 a model because a model is an expectation never
7 designed to -- extremely accurate for any particular
8 year, and so that's how we do it.

9 Q. So if I understand you correctly,
10 though, you employed this model to try and predict
11 accurately what the yield would have been in 2005
12 and 2006?

13 A. Yes.

14 Q. And you predicted, if I am reading Table
15 10 of your report correctly, that the yield for
16 corn in 2005 would have been 206 bushels per acre?

17 A. That's correct.

18 Q. Would that not be approximately
19 10 percent higher than the highest yield ever
20 recorded?

21 A. That's correct.

22 Q. Okay. With respect to indirect effects,
23 you earlier testified you had no opinion regarding
24 the indirect effects analyzed in this report. On
25 what do you base your more recent opinion that

26

1 those effects are legitimate considerations?

2 A. Well, I had understood your question as did
3 I have an opinion and that I did the analysis to get
4 at it and I didn't in that regard, but I do have an
5 opinion about the appropriateness of including
6 indirect impacts because they're so often included
7 and because we know they exist. We know that's how
8 the economy works.

9 Q. In what context are they included? Did
10 I hear you say something about welfare analyses?

11 A. Well, policy analysis and raw economy
12 analysis.

13 Q. Have they regularly been used to predict
14 indirect effects in a particular year with any
15 accuracy?

16 A. I don't know that.

17 Q. Have they ever been used for purposes of
18 a damage calculation in a legal proceeding, to
19 your knowledge?

20 A. I believe so.

21 Q. In what context?

22 A. I believe they were in the Kansas and
23 Colorado situation.

24 Q. Is this with regard to the social
25 accounting matrix?

1 A. I mean, I don't know the details. I think
2 it was. I believe it was IMPLAN that was used, but I
3 don't know the details.

4 Q. So if I understand you correctly, you
5 have no opinion in this proceeding as to the
6 actual number, only that the concept of indirect
7 effects is a legitimate concept?

8 A. Well, my only opinion that I have with the
9 actual number would be my trust in colleagues that I
10 think are quite good at it, so yes.

11 Q. All right. That's all we have got.
12 Pete?

13 MR. AMPE: It didn't bring anything
14 up.

15 (Witness excused.)
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TERRY KASTENS

STATE OF _____)

) SS:

COUNTY OF _____)

Subscribed and sworn to before me this _____
day of _____, 2009.

NOTARY PUBLIC

My Commission Expires: _____

In re: Non-Binding Arbitration

C E R T I F I C A T E

1
2
3 I, JANE A. BLACKERBY, a Certified Court
4 Reporter within and for the State of Missouri, hereby
5 certify that the within-named witness was first duly
6 sworn to testify the truth, and that the deposition
7 by said witness was given in response to the
8 questions propounded, as herein set forth, was first
9 taken in machine shorthand by me and afterwards
10 reduced to writing under my direction and
11 supervision, and is a true and correct record of the
12 testimony given by the witness.

13 I further certify that I am not a relative
14 or employee or attorney or counsel of any of the
15 parties, or relative or employee of such attorneys or
16 counsel, or financially interested in the action.

17 WITNESS my hand and official seal at
18 Kansas City, Jackson County, Missouri, this 28th day
19 of February, 2009.

20
21
22 _____
JANE A. BLACKERBY, RPR, CCR No. 877

23 Certified Court Reporter
24
25