

UNITED STATES PATENT AND TRADEMARK OFFICE

---

BEFORE THE PATENT TRIAL AND APPEAL BOARD

---

GEOSYS-INTL, INC.,  
Petitioner,

v.

FARMERS EDGE PRECISION CONSULTING INC.,  
Patent Owner.

---

Case IPR2015-00711  
Patent 7,343,867 B2

---

Before JAMES T. MOORE, JOSIAH C. COCKS, and  
TIMOTHY J. GOODSON, *Administrative Patent Judges*.

MOORE, *Administrative Patent Judge*.

FINAL WRITTEN DECISION  
*Inter Partes Review*  
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

## I. BACKGROUND

Geosys-Intl, Inc. (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting *inter partes* review of claims 1–25 of U.S. Patent No. 7,343,867 B2 (Ex. 1001, or “the ’867 patent” herein). Farmers Edge Precision Consulting, Inc. (“Patent Owner”) timely filed a Preliminary Response (Paper 6, “Prelim. Resp.”) to the Petition. We entered a decision instituting review of claims 1–25 pursuant to 35 U.S.C. § 314 on August 21, 2015. Paper 9, “Inst. Dec.”

Subsequent to institution, Patent Owner filed a corrected Patent Owner Response (Paper 14 (“PO Corr. Resp.”)) and Petitioner filed a Reply (Paper 16 (“Pet. Reply”)). We have thoroughly considered these papers and the appropriately submitted evidence cited therein.

We entertained oral argument in this proceeding on April 28, 2016. A transcript of that argument is of record. Paper 33.

Patent Owner has moved to exclude evidence. Paper 24. We deny the motion for the reasons discussed below.

We have jurisdiction to hear this *inter partes* review under 35 U.S.C. § 6(c). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

For the reasons discussed herein, Petitioner has shown by a preponderance of the evidence that claims 1–25 of U.S. Patent No. 7,343,867 B2 are unpatentable.

### A. Related Matters

The ’867 patent is the subject of a civil action between the parties in the U.S. District Court for the District of Minnesota, *Geosys-Intl, Inc. v. Farmers Edge Precision Consulting, Inc.*, Case No. 15-cv-00543-PJS. See Prelim. Resp. 3. It appears from the docket report of that declaratory

judgment case that the proceeding remains stayed pending the outcome of the instant and other proceedings before this Board. *See* 0:15-cv-00543-PJS, entry 56.

Those other proceedings pending before this Board are IPR2015-00708 and IPR2015-00709, which involve the same parties and related U.S. Patent Nos. 6,889,620 and 7,171,912, , respectively.

*B. The '867 Patent (Ex. 1001)*

The '867 patent is titled “Method for Prescribing Site-Specific Fertilizer Application in Agricultural Fields.” Ex. 1001, Title. The method described in the '867 patent seeks to minimize the amount of fertilizer farmers apply to a field while maintaining the maximum yield. *Id.* at 1:15–21.

The Background of the '867 patent describes prior art variable-rate fertilizer application systems that took account of certain field conditions, such as existing soil fertilizer content or soil type, and accordingly dispensed different amounts of fertilizer based on those conditions. *Id.* at 2:14–50. “The maximum possible crop yield . . . that a particular location in a field is able to attain may vary from location to location.” *Id.* at 2:51–54. “Despite this potential variation in yield throughout a single field, the prior art variable-rate fertilizer application systems . . . employ a single yield goal measure for a field.” *Id.* at 2:64–67.

The Background of the '867 patent also describes the following equation for calculating the nitrogen needs of a field:

A conventional method for calculating nitrogen needs for a field involves the following equation:

$$N_{FERT} = N_{CROP} - N_{RES.SOIL} - (N_{OM} + N_{PREV.CROP} + N_{MANURE}) - N_{IRR}$$

where:

$N_{FERT}$  = fertilizer N recommendation

$N_{CROP}$  = yield goal x N yield factor

$N_{RES.SOIL}$  = preplant soil profile NO<sub>3</sub>-content (or residual soil)

$N_{OM}$  = organic N mineralization

$N_{PREV.CROP}$  = legume N availability

$N_{MANURE}$  = manure N availability

$N_{IRR}$  = irrigation water N availability.

Ex. 1001, 1:39–53.

The '867 patent seeks to improve on prior art systems by creating a map of “site-specific amounts of a soil nutrient needed at each site to produce the maximum possible crop yield that the site is capable of producing.” *Id.* at 3:6–9. Site-specific amounts of nutrient currently existing in the field are subtracted from the site-specific amounts of nutrient needed for the crop, thus producing a map of site-specific amounts of the soil nutrient that need to be applied to the field. *Id.* at 3:10–15. Fertilizer is applied by conventional variable-rate fertilizer application methods. *Id.*

### *C. Illustrative Claims*

Claims 1 and 15 are independent method claims. Claims 2–7 depend, directly or indirectly, from claim 1. Claims 16–25 depend, directly or indirectly, from claim 15. Claim 8 is an independent claim directed to a computer program. Claims 9–14 depend, directly or indirectly, from claim 8.

Claims 1, 8, and 15 are illustrative of the subject matter at issue, and are reproduced below:

1. A method implemented in at least one computer program to provide a map of site-specific amounts of a soil nutrient to be applied in fertilizer to an agricultural field divided into sites, the method comprising:

calculating for the field, by use of a map of site-specific measures of a soil wetness index, a map of site-specific amounts of the soil nutrients needed to produce at each site a maximum possible crop yield; and

subtracting, from the site-specific amounts of the soil nutrient needed to produce at each site a maximum yield, site-specific measures for the soil nutrient existing in the field, thereby producing a map of site-specific amounts of the soil nutrient to be applied in fertilizer to the field.

8. A computer program, residing on a computer-readable medium, for providing a map of site-specific amounts of a soil nutrient to be applied in fertilizer to an agricultural field divided into sites, the computer program comprising:

instructions for causing a computer to:

calculate for the field, from a topographic map for the field, a map of site-specific measures of a soil wetness index;

calculate for the field, from the map of site-specific measures of a soil wetness index, a map of site-specific amounts of the soil nutrient needed to produce at each site a maximum possible crop yield; and

subtract, from the site-specific amounts of the soil nutrient needed to produce at each site a maximum possible crop yield, site-specific measures of the soil nutrient existing in the field, thereby producing a map of site-specific amounts of the soil nutrient to be applied in fertilizer to the field.

15. A method implemented in at least one computer program to provide a map of site-specific amounts of a soil nutrient to be

applied in fertilizer to an agricultural field divided into sites, the method comprising:

calculating a map for the agricultural field of site-specific of soil nutrient amount needed to produce at each site a maximum possible crop yield by use of a map of site-specific field characteristic data for the agricultural field generated using a satellite image of the agricultural field; and

subtracting, from the site-specific soil nutrient amounts for maximum yield for the field, site-specific measures for the soil nutrient existing in the field, thereby producing a map of site-specific amounts of the soil nutrient to be applied in fertilizer to the field.

#### *D. References Relied Upon*

The grounds which were instituted rely on the following references cited in the Petition:

|           |                    |               |          |
|-----------|--------------------|---------------|----------|
| Dickson   | US 2001/0016053 A1 | Aug. 23, 2001 | Ex. 1003 |
| Shibusawa | US 6,937,939 B1    | Aug. 30, 2005 | Ex. 1004 |
| Blackmer  | US 6,505,146 B1    | Jan. 7, 2003  | Ex. 1005 |
| Hauwiller | US 6,236,907 B1    | May 22, 2001  | Ex. 1006 |

#### *E. Instituted Grounds of Unpatentability*

Petitioner contended that claims 1–25 of the '867 patent are unpatentable on the following grounds, which the Board instituted review upon:

| References                                        | Basis | Claim(s)<br>Challenged |
|---------------------------------------------------|-------|------------------------|
| Hauwiller and Background of '867 Patent           | § 103 | 15–17 and 20–23        |
| Hauwiller, Background of '867 Patent, and Dickson | § 103 | 18                     |

|                                                               |       |                   |
|---------------------------------------------------------------|-------|-------------------|
| Hauwiller, Background of '867 Patent, and Shibusawa           | § 103 | 24 and 25         |
| Hauwiller, Background of '867 Patent, and Blackmer            | § 103 | 1–5, 8–12, and 19 |
| Hauwiller, Background of '867 Patent, Shibusawa, and Blackmer | § 103 | 6, 7, 13, and 14  |

## II. ANALYSIS

### A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are given their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard). Under the broadest reasonable construction standard, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). The '867 patent is unexpired, with its maintenance fees current.

#### 1. “Calculating a Map”

Petitioner proposes that the phrase “calculating a map” in claims 1, 6, 8, 13, 15, 17–19, and 24 should be construed to mean “calculating values for creating a map.”<sup>1</sup> Pet. 8–9. Petitioner argues that this construction is a more

---

<sup>1</sup> This phrase does not appear identically in the claims. For example, in some claims, the phrase is separated by intervening words or phrases. See, e.g., Ex. 1001, claim 1 (“**calculating** for the field, by use of a map of site-specific measures of a soil wetness index, **a map** of site-specific amounts of

accurate description of what is being calculated, as “a map cannot generally be ‘calculated,’ as that term is used in its ordinary sense.” *Id.* Patent Owner argues that Petitioner’s proposed construction is inconsistent with the plain meaning of the term, because it suggests that calculating values or parameters alone is sufficient to meet the claim element, as long as those values are “for creating a map” at some point. Prelim. Resp. 11–12. We agree with Patent Owner that performing a calculation, by itself, is too broad an interpretation to give this claim element. Rather, the claim language requires that a map must actually be created. Thus, we construe “calculating a map” to mean “performing calculations to produce a map.”

## 2. “*Maximum Possible Crop Yield*”

Petitioner proposes that the phrase “maximum possible crop yield” in claims 1, 8, and 15 should be construed to mean “yield goal.” Pet. 10. Petitioner’s argument for this construction is based on the following sentence in the Specification: “The maximum possible crop yield—that is, ‘yield goal,’ which factors into the calculation of  $N_{CROP}$  in the equation above—that a particular location in a field is able to attain may vary from location to location.” Ex. 1001, 2:51–54.

Patent Owner responds that the reference to “yield goal” in this sentence is not an attempt to define “maximum possible crop yield” but an explanation of the variables in an equation that was introduced earlier in the

---

soil nutrients needed”). Neither Petitioner nor Patent Owner contends that the phrase carries a different meaning in these different claims. *See* Pet. 8–9; Prelim. Resp. 11–12. For the purposes of this decision, we understand the phrase “calculating a map” to have the same construction, regardless of whether it appears as “calculating . . . a map,” “calculate . . . a map,” or “calculating a map.”

Background. Prelim. Resp. 15–16. Patent Owner further argues that “maximum possible crop yield is one of multiple possible yield goals.” *Id.* at 16. Patent Owner points to the discussion in the ’867 patent of ensuring yields that are “adequate” while maintaining certain protein levels as an indication that “yield goal” need not always be the same as “maximum possible crop yield.” *Id.* at 15–16 (citing Ex. 1001, 4:13–16).

The ’867 patent does not define the phrase “maximum possible crop yield” in a manner different than its ordinary meaning. *See In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (“‘Where an inventor chooses to be his own lexicographer and to give terms uncommon meanings, he must set out his uncommon definition in some manner within the patent disclosure’ so as to give one of ordinary skill in the art notice of the change.”) (quoting *Intellicall, Inc., v. Phonometrics, Inc.*, 952 F.2d 1384, 1387–88 (Fed. Cir. 1992)).

We, therefore, agree with Patent Owner that the disclosure in the ’867 patent that “maximum possible crop yield” can be used as the “yield goal” variable in a certain prior art equation would not indicate to a skilled artisan that “maximum possible crop yield” and “yield goal” are interchangeable in every circumstance. Rather, a skilled artisan reviewing the ’867 patent would understand that maximum possible crop yield is one possible yield goal, but not the only possible yield goal. Thus, for the purposes of this decision, we do not adopt Petitioner’s proposal to construe “maximum possible crop yield” to mean “yield goal.” Instead, we apply the ordinary and customary meaning of “maximum possible crop yield.” We do not provide an express construction because, having addressed the claim

construction issue that the parties dispute, it is not apparent how the ordinary meaning of the phrase would be clarified through further explication.

We also determine that no other terms require express construction for the purposes of this decision. *See Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (“[C]laim terms need only be construed ‘to the extent necessary to resolve the controversy.’”) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).<sup>2</sup>

*B. Level of Skill in the Art*

Patent Owner asserts that the level of ordinary skill in the art at the time the invention was made was a person having at least a Bachelor of Science degree in agronomy or a related field, and at least a Master’s Degree in a discipline that involves engineering systems using remote sensing data, or comparable work experience. PO Corr. Resp. 26. Further, such a person would have had some practical experience integrating these remote sensing systems. *Id.* at 27.

Petitioner asserts that a person of ordinary skill in the art at the time of the invention would have knowledge of Geographic Information Systems (GIS) and their use for precision farming and agriculture. In particular, Petitioner asserts that such person would be familiar with the known and developing ways and factors that help to ascertain the amount of fertilizer to place at a particular location and the ways that such information can be implemented with GIS. Educationally, a person of ordinary skill would have had at least

---

<sup>2</sup> We employ the same claim constructions in this Final Written Decision as we did in our Decision instituting trial. We observe that, following institution, neither party challenged those constructions or proposed alternative constructions for any claim term.

a Bachelor of Science degree in Agricultural Systems Management, Agriculture, Agronomy, or a related degree and would have had several years of experience with precision farming. Pet. 10–11.

We find that these two descriptions of the level of skill in the art are fairly consistent, and further are jointly consistent with the documentary and testimonial evidence of record, including Exhibits 1001, 1003, 1004, 1005, 1006, and 2033. We, therefore, find that a person of ordinary skill would include the qualifications and experience as noted above by the Patent Owner.

*C. Obviousness Grounds Based on Hauwiller*

*1. Claims 15–17 and 20–23 – Hauwiller and Background*

Petitioner argues that claims 15–17 and 20–23 are unpatentable under 35 U.S.C. § 103(a) over Hauwiller in view of the Background of the '867 patent. Pet. 38–43.

*a. Summary of Hauwiller (Ex. 1006)*

Hauwiller describes a system and method for creating variable rate application maps for applying dispensing materials to a field, which maps “allow the user to vary the dispensing rate of the dispensing materials at various field locations depending upon different field conditions at different field locations.” Ex. 1006, 1:15–19. According to Hauwiller, this system improved on previous approaches in which dispensing materials were applied uniformly across a field. *Id.* at 1:23–34.

Hauwiller describes that the process begins by inputting attribute data and geographical data into the system for use in determining optimum treatment systems. *Id.* at 8:20–23. The input data preferably also includes recommendation equations, which “are the mathematical formulas that

express the relationship between existing field conditions and the desired crop yield (i.e., relate field data to desired output) for determining the amount of dispensing material, and may be derived from the empirical data sources or determined by an expert.” *Id.* at 8:27–28, 8:36–42. Hauwiller further states that recommendation equations may determine dispensing rates based on soil sample data and “defined yield potential or productivity for a particular crop based upon field characteristics or conditions.” *Id.* at 9:29–32. Hauwiller also discloses the following:

Desired yield potential varies depending upon the soil characteristics by location. Thus, the expert system may calculate dispensing rates by location based upon the desired recommendation equation which incorporates a yield goal map based upon soil properties, or alternatively the recommendation equation may use a constant yield goal for a field. Preferably, a soil characteristic map is inputted to the system to construct a yield goal map for creating an application map based upon site specific yield goals.

*Id.* at 9:32–41.

Patent Owner, on the other hand, asserts that Hauwiller is simply using a regular soil test recommendation with different potential yields. PO Corr. Resp. 19.

*b. Analysis of Claim 15*

*i. Petitioner’s Contentions and  
the Institution Decision Findings*

Petitioner contends that Hauwiller, in combination with the description of the prior art in the Background of the ’867 patent, renders obvious the method recited in claim 15. Pet. 38–41. Claim 15, to recap, requires the following:

15. A method implemented in at least one computer program to provide a map of site-specific amounts of a soil nutrient to be applied in fertilizer to an agricultural field divided into sites, the method comprising:

calculating a map for the agricultural field of site-specific of soil nutrient amount needed to produce at each site a maximum possible crop yield by use of a map of site-specific field characteristic data for the agricultural field generated using a satellite image of the agricultural field; and

subtracting, from the site-specific soil nutrient amounts for maximum yield for the field, site-specific measures for the soil nutrient existing in the field, thereby producing a map of site-specific amounts of the soil nutrient to be applied in fertilizer to the field.

Ex. 1001, 11:54–12:13.

Specifically, Petitioner asserts that Hauwiller teaches “calculating a map for the agricultural field of site-specific of soil nutrient amounts needed to produce at each site a maximum possible crop yield by use of a map of site specific field characteristic data . . . generated using a satellite image of the agricultural field” (Ex. 1001, 12:3–8) because Hauwiller describes a “system 104 [which] contains GIS software . . . enabling the system to . . . perform mathematical and spatial calculations along and through different types of data based on an embedded expert system’s or user’s recommendations for producing application treatment maps.” Pet. 39 (citing Ex. 1006, 3:60–66).

Petitioner also urges that Hauwiller describes that “[r]ecommendation equations **226** may determine dispensing rates for materials based upon soil sample data **210** and defined yield potential.” Ex. 1006, 9:29–31.

Petitioner urges that Hauwiller describes subtracting measures of nutrients existing in the field from nutrient amounts for maximum yield to produce a map of nutrients to be applied. Specifically, it is urged that Hauwiller describes “[r]ecommendation equations **226** are the mathematical formulas that express the relationship between existing field conditions and the desired crop yield (i.e., relate field data to desired output) for determining the amount of dispensing material, and may be derived from the empirical data sources or determined by an expert in the field of agriculture, as defined hereinbefore.” *Id.* at 8:36–42. In the course of this process, “[p]referably, a soil characteristic map is inputted to the system to construct a yield goal map for creating an application map based upon site specific yield goals.” *Id.* at 9:38–41. Petitioner asserts that the use of a subtracting step is inherent in the recommendation equations of Hauwiller. Pet. 40–41.

Petitioner further asserts that the Background of the ’867 patent describes a “conventional method for calculating nitrogen needs for a field.” Ex. 1001, 1:41–42. The referenced portion of the ’867 patent identifies an equation for the nitrogen calculation. The equation calculates  $N_{\text{FERT}}$  (the fertilizer nitrogen recommendation for a field) from several variables, including  $N_{\text{CROP}}$  (the crop yield goal times the nitrogen yield factor),  $N_{\text{RES.SOIL}}$  (the pre-plant soil profile  $\text{NO}_3$  content) and  $N_{\text{OM}}$  (the organic nitrogen mineralization).

In the Decision on Institution (Paper 9), we determined that the Petitioner had not shown inherency of the subtracting step, but had adequately shown that the subtraction step would have been obvious based on Hauwiller and the equation discussed in the Background of the ’867 patent. Inst. Dec. 21–22.

We also determined that the '867 patent describes the equation as a “conventional method for calculating nitrogen needs for a field.” Ex. 1001, 1:41–42. Hauwiller’s openness to a variety of recommendation equations—or, as Patent Owner terms it, Hauwiller’s “agnosticism” regarding which recommendations are used (Prelim. Resp. 45)—supports the obviousness of employing within Hauwiller’s system a conventional equation such as the one set forth in the Background of the '867 patent.

Finally, while the conventional equation includes several variables, we found that a basic teaching of the equation is that in calculating the fertilizer recommendation, the amount of nitrogen already present should be subtracted from the nitrogen needed to realize the yield goal. *See* Ex. 1001, 1:39–50.

Patent Owner is correct that the '867 patent describes the equation as being a conventional approach for calculating nitrogen needs “for a field” rather than for a specific site within the field. Ex. 1001, 1:41–42. But Hauwiller recognizes that “[d]esired yield potential varies depending upon the soil characteristics by location” and, for that reason, describes the desirability of constructing “a yield goal map for creating an application map based upon site specific yield goals.” Ex. 1006, 9:32–41. *See also* Fig. 3A.

*ii. Patent Owner’s Position*

Patent Owner asserts that there was no motivation to combine Hauwiller with the technologies mentioned in the '867 patent’s background. PO Corr. Resp. 27. The basis for this position is Patent Owner’s contention that:

- it was neither conventional nor obvious to modify Havlin's N recommendation equation<sup>3</sup> for a field in the site-specific manner claimed at the time of the invention;

- neither Hauwiller nor the Background suggest using measures of biomass from past season(s) to determine site-specific yield goals; and

- neither Hauwiller nor the Background suggest (a) the measures of biomass, as recited in the claims or (b) the claimed use of the leaf area index serving as the measures of biomass. *Id.* at 28.

Patent Owner asserts, based primarily upon the testimony of Ronnie W. Heiniger, Ph. D. (Ex. 2033), that one of ordinary skill in the art at the time the invention was made would consider the Havlin equation to be inappropriate for sub-field sites. PO Corr. Resp. 28–33.

According to Dr. Heiniger, the Havlin equation is designed for applications of fertilizer to an entire field at a constant rate. Ex. 2033 ¶ 155. Dr. Heiniger testifies that there was “real skepticism” that one could apply these equations to sub fields and obtain any benefit. *Id.* ¶ 195. Moreover, he opined that nitrogen, as a mobile nutrient, would move or “leach.” *Id.* ¶ 196. Dr. Heiniger also opined that one would not “have confidence” that the equations could be scaled down to sub-field level. *Id.* ¶ 198.

Also according to Dr. Heiniger, a post-invention study corroborated that this site-specific approach would not work. PO Corr Resp. 31 (citing Ex. 2033 ¶ 200, Ex. 2015).

Dr. Heiniger also testifies that using the Havlin equation in Hauwiller does not make sense. PO Corr Resp. 31 (citing Ex. 2033 ¶ 201). This is

---

<sup>3</sup> Havlin et al., *Soil Fertility and Fertilizers*, 1999, Prentice Hall, New Jersey, cited at Ex. 1001, 1:41–55.

based primarily on the statement of Dr. Heiniger that there “would be no need to compute the amount of fertilizer needed based on soil nutrient amounts already in the soil, and then to subtract away those same soil nutrient amounts.” Ex. 2033 ¶ 201.

*iii. Analysis*

We find that Hauwiller describes the claimed method “implemented in at least one computer program to provide a map of site-specific amounts of a soil nutrient to be applied in fertilizer to an agricultural field divided into sites.” More specifically, Hauwiller describes GIS software of a system for creating application maps for controlling agricultural equipment. Pet. 39, Ex. 1006 4:2–4. Hauwiller also describes evaluating characteristics such as topography and soil data for a particular field for precision farming and site specific farming applications, and using that information to create application maps for variable rate application of materials based upon varied field characteristics or conditions. Pet. 39, Ex. 1006, 3:24–30. *See also* Ex. 1006, Fig. 3A, and its associated description.

We additionally find that Hauwiller describes “calculating, from soil characteristic data, a map of soil nutrient needed to produce maximum possible crop yield by use of a map of site-specific field characteristic data for the agricultural field” because it describes system 104 contains GIS software enabling the system to perform mathematical and spatial calculations along and through different types of data based on an embedded expert system’s or user’s recommendations for producing application treatment maps. Pet. 39 (citing Ex. 1006 3:60–66). Hauwiller also describes that recommendation equations may determine dispensing rates for materials

based upon soil sample data and defined yield potential. Pet. 39, Ex. 1006 9:29–31.

We further find that maximizing crop yield was a known and common yield goal in the prior art. *See, e.g.*, Ex. 1003 ¶ 3 (“Maximization of crop yields is critical to the agricultural industry. . . .”); Ex. 1004, 32:53–60; Ex. 1005, 1:46–48, 3:62–64.

As to the satellite portion of claim 15 (“generated using a satellite image of the agricultural field”), Petitioner’s declarant, Dr. Christian Johannsen, refers to the description in the Background of the ’867 patent of a prior art technique described in US Patent 4,630,773 for preparing a digital soil map from an aerial infrared photograph. Ex. 1009 ¶ 69 (citing Ex. 1001, 2:36–50). Dr. Johannsen testifies that it would have been obvious to substitute a satellite approach for the aerial approach in preparing a soil map, noting that “[t]he satellite image would . . . have provided GPS coordinates for ground control of application of the fertilizer” and “satellite images would have made the capturing of field characteristic data very fast and efficient.” *Id.* ¶¶ 69, 71. As explained below, we find Dr. Johannsen’s testimony persuasive.

Turning to the substance of Patent Owner’s arguments regarding claim 15, we address Dr. Heiniger’s testimony. First, we observe that Dr. Heiniger fails to account for the combination of art as a whole. Despite our careful perusal of the entirety of Dr. Heiniger’s testimony, we are unable to find where he effectively addressed the description of site specific application described in Hauwiller.

More specifically, Figure 3A of Hauwiller, discussed generally through its description at Pet. 40–41, is reproduced below, and shows the following:

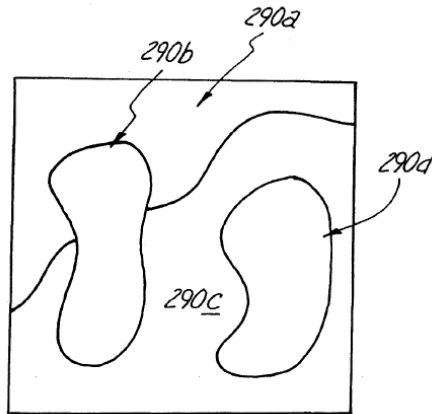


*Figure 3A*

Figure 3A is a plan view of a field having different areas.

Hauwiller describes Figure 3A as follows:

The GIS system of the present invention also includes a system for displaying via an output device **107** (FIG. 4) a polygon type boundary map, such as a boundary map of areas of different yield goal based upon a spatial soil characteristic map, or areas of different field characteristics based upon a spatial field characteristic map, as shown in FIG. 3A. As shown, different regions **290a-d** have different field characteristics which may be incorporated by a recommendation equation for determining dispensing rates by location. Preferably, the GIS system **104** of the present invention includes a user interface system designed to allow a user to modify a predefined boundary map, such as a yield goal map based upon soil properties, or create an input map. Preferably the interface system allows the user to define or change different yield goal values or attribute values for different field characteristic areas, or draw or reconfigure boundaries for different field characteristic regions or areas. Thus, the boundaries for areas **290a-d** may be drawn or

changed and the areas or regions **290a-d** may be assigned different yield goals via the user interface.

Ex. 1006, 9:45–64.

There is, therefore, ample evidence to support our finding that Hauwiller describes site-specific analysis for executing application rate equations. Ex. 1006, Abstract. *See also id.* at 8:8–19.

Dr. Heiniger testifies that there was “real skepticism” that doing this would have any benefits over the generic field average approach. Ex. 2033, ¶ 195. However, because we are not pointed to any objective evidence for his opinion of the state of the conventional thinking in the art, we find this allegation unpersuasive.

As to Dr. Heiniger’s observation that nitrogen is a mobile nutrient and would leach from location to location, he states there was “a high degree of skepticism” that specific variable rate applications could be cost effective in pre-plant applications. Ex. 2033 ¶ 196. Again, we are not pointed to any specific objective evidence in support of this assertion. To us, it seems only logical that varying application rates, leach rates, irrigation rates, and the specificity with which one selects the site size for differential application, all would play into the decision whether differential application could be technically effective. We see no significant discussion of the variables at play that would support a blanket economic conclusion such as that reached by Dr. Heiniger.

Dr. Heiniger also testified that the post invention publication of a research study<sup>4</sup> indicated that “mechanically trying to break up a non-site-

---

<sup>4</sup> Ferguson, et al. *Site-Specific Nitrogen Management of Irrigated Maize: Yield and Soil Residual Nitrate Effects*, Soil. Sci. Am. J. 66:544–553 (2002) (Ex. 2015).

specific recommendation equation and using it in a site-specific manner simply does not work.” Ex. 2033 ¶ 200.

We have carefully reviewed Ferguson and find that it does not support such a generalization. Ferguson applied uniform management (UM) techniques and variable rate techniques (VRT) to four different fields, each having different soil types over a period of years. Ex. 2015, 3–4. However, the discussion of results indicates that there “was little or no difference in total applied N between the UM and VRT treatments for most site years.” *Id.* at 4. The summary concluded that there “was no disadvantage to using variable rate N application in terms of N applied or grain yield, but no advantage that would justify the cost and effort of variable rate application with procedures used in this study.” Ex. 2015, 8. At worst, we find that the practice works just as well as conventional techniques, even with the systemic fault of one site being over fertilized due to the miscalibration of a radar gun. *Id.* at 5.

As to Dr. Heiniger’s statement that it would not make logical sense to compute the amount of fertilizer needed based on soil nutrient amounts already in the soil, and then to subtract away those same soil nutrient amounts, we find that this misinterprets the art.

Petitioner has asserted that the subtraction step is inherent in the recommendation equations of Hauwiller because of the reference to determining the amount of dispensing material to be applied. Pet. 40–41. Hauwiller expressly notes that application rate equations are formulas which express the relationship “between existing field conditions and desired output.” Ex. 1006, 9:15–18. While we disagree that the subtraction step is inherent, we find that one of ordinary skill in the art would understand that

field conditions must be taken into account, and the differences between desired fertilizer levels and current fertilizer levels would readily be reached by an obvious and well-known subtraction step. Pet. 4; Ex. 1001 1:25–2:3.

Patent Owner additionally asserts that it would not have been obvious to use satellite imagery in Hauwiller’s system. PO Corr. Resp. 32. This is said to be because Ortlip (Ex. 2016) adjusts dispensing rates based upon soil type, not yield. *Id.* Patent Owner does not put forth sufficient evidence to counter the persuasive testimony of Dr. Johannsen regarding the obviousness of substituting satellite imagery for aerial imagery, when combined with Hauwiller’s maps, as both are remote sensing. Ex. 1009, ¶ 69. Dr. Heiniger points to a perceived difference in measurement in the single Ortlip reference, but does not address Dr. Johannsen’s testimony or provide sufficient evidence to counter the Petitioner’s evidence that one of ordinary skill could substitute the type of remote sensing, and therefore the combination of references would render the claimed invention obvious to one of ordinary skill in the art at the time the invention was made. Ex. 2033 ¶ 157.

Patent Owner further asserts that the combination of Hauwiller and Background of the ’867 patent does not disclose “calculating a map for the agricultural field of site-specific soil nutrient amounts needed to produce at each site a maximum possible crop yield by use of a map of site-specific field characteristic data for the agricultural field generated using a satellite image of the agricultural field” as recited in claim 15. PO Corr. Resp. 33. The principal deficiency is said to be that the yield and amount of fertilizer are not the same as that needed for a maximum crop yield. An additional deficiency is said to be that Hauwiller does not describe that the field data is

generated using satellite imagery. Patent Owner further asserts that the '867 patent Background does not cure these deficiencies. *Id.* at 34.

We are not persuaded. As explained above, we find that Petitioner has put forth sufficient evidence to establish that the use of satellite imagery in the place of aerial imagery to determine field conditions renders the use of satellite imagery obvious. The testimony of Dr. Johannsen on that point is persuasive as to speed and cost for motivating the substitution. Dr. Heininger asserts that the satellite imagery would have made a poorer performing system. Ex. 2033 ¶ 192. However, we find that the basis for that opinion is not adequately or persuasively described.

Patent Owner lastly asserts that the subtraction step at the site-specific level to produce a map of site specific amounts to be applied is not described by the combination of Hauwiller and the Background of the '867 patent. PO Corr. Resp. 35. The principal thrust of this argument is that if Hauwiller provides data concerning a nutrient level in the soil and then provides a calibrated recommendation based on that test result, it cannot logically have the steps of determining nutrients for a yield goal and then subtracting off what was already in the soil. *Id.*

The flaw in this argument is that the references taken together teach production of an application map with site specificity (Ex. 1006, Fig. 3.), and one with the level of skill in the art would recognize that yield goal, including maximum yield, are well-known in the art. Ex. 1004, 32:53–60; Ex. 1005, 1:46–48, 3:62–64. Considering the level of fertilizer in the soil is also well-known for fertilizer application. Ex. 1001, 1:39–50.

As a consequence, we determine that the Petitioner has shown that all of the features of claim 15 are disclosed in Hauwiller and the prior art

described in the Background of the '867 patent, and that there would have been adequate reason to combine those teachings. In our view, Patent Owner's technical arguments and submitted testimonial evidence do not outweigh the probative weight of Petitioner's objective evidence of record supporting Petitioner's showing that all of the features of claim 15 are disclosed in Hauwiller and the prior art described in the Background of the '867 patent.

*c. Analysis of Claim 16*

Claim 16 recites that “the field characteristic is a measure of biomass produced by the field in one or more past growing seasons.” Ex. 1001 12:14–16. As this claim depends from claim 15, this measure of biomass would have been made by satellite imagery from prior growing seasons.

Petitioner asserts that Hauwiller describes inputting data, including yield monitor data, field history data, and previous and future crop information, including planting population and yield received, into the system for determining optimum treatment. Pet. 42 (citing Ex. 1006, 8:20–35, 6:53–55). Petitioner also asserts that the Background of the '867 patent admits that biomass “is known to be directly related to crop yield.” *Id.* (citing Ex. 1001, 1:59–63).

Patent Owner asserts that the combination of Hauwiller and the '867 patent background do not disclose this element. PO Corr. Resp. 36. In part, the argument rests upon the differences in measurement of the nutrients. Hauwiller, it is urged, does not render the instant claim obvious because Hauwiller measures the nutrients available in the soil, while crop data such

as yield measures the plant's nutrient uptake. *Id.* at 37. Moreover, it is noted by Patent Owner that yield and biomass are not the same thing. *Id.*

We determine that Petitioner's evidence of unpatentability as regards to claim 16 outweighs the Patent Owner's evidence. We find that previous crop information and field history includes biomass, which is known to be "directly related to crop yield." Ex. 1001, 1:59–63. Hauwiller also uses geographic data in forming its maps. Ex. 1006, 5:60–64. Finally, we find that capturing the set of biomass by prior satellite photography would have been an obvious substitution for aerial photography, as both use remote sensing.

Accordingly, we determine that the Petitioner has shown that all of the features of claim 16 are disclosed in Hauwiller and the prior art described in the Background of the '867 patent, and that there would have been adequate reason to combine those teachings.

*d. Analysis of Claim 17*

Claim 17 includes the additional limitation of "calculating, from a map of site-specific image data taken of the field during one or more past growing seasons, a map of site-specific measures of a leaf area index, the leaf area index serving as the measure of biomass produced by the field." Ex. 1001, 12:18–23.

Petitioner asserts that the Background of the '867 patent describes that there was a known measure of biomass called leaf area index, measurable by taking the leaves and measuring their mass in a laboratory, or by remotely sensing canopy reflective data. Pet. 42–43 (citing Ex. 1001, 1:61–28).

Patent Owner asserts that this claim element is not disclosed. PO Corr. Resp. 39. First, it is urged that Hauwiller and Background do not

describe the recited measure of biomass, and as a consequence cannot describe leaf area index. *Id.* We find that the evidence of record does not support this contention.

For example, the Background of the '867 patent describes that:

A measure of "biomass," which is basically the density or amount of plant-life, is known to be directly related to crop yield. One measure of biomass for crops such as corn and soybeans is known as "leaf area index" (LAI), which can be measured in at least two ways. First, LAI can be measured directly by taking all the crop leaves from a unit field area and measuring in a laboratory the total area of one side of the leaves using an area meter. Another way by which LAI can be derived is from remotely sensed data using a canopy reflectance model. See Kuusk, "A Fast, Invertible Canopy Reflectance Model," in *Remote Sensing of Environment*, 51:342-50 (1995); Verhoef, "Light Scattering by Leaf Layers with Application to Canopy Reflectance Modeling: The SAIL Model," in *Remote Sensing of Environment*, 16:125-41 (1984). The later method is non-destructive to the crops and suitable for agricultural field management.

Ex. 1001, 1:61–2:10.

Patent Owner next asserts that satellite imagery could not at that time provide accurate site-specific values of yield. PO Corr. Resp. 39, citing Johannsen's own publication (Ex. 2013 at 5). Dr. Heiniger also testifies that one of ordinary skill in the art would not have found the combination obvious. Ex. 2033 ¶ 174. Dr. Heiniger testifies that one of ordinary skill in the art did not expect that the LAI could adequately measure site-specific yield. *Id.* ¶ 173. Dr. Heiniger also asserts that Hauwiller uses soil characteristics while LAI is a different approach not readily combinable. *Id.* ¶ 174.

While we do understand that there is some theoretical difference between soil testing for available nutrients and remote sensing for biomass, we are not persuaded that one of ordinary skill in the art would not be motivated to utilize the known LAI, a measure of biomass, to create yield maps and fertilizer application maps.

The evidence of record supports a finding that using leaf area index as a substitute for biomass was known. Acquiring and using remotely sensed field data was known. Ex. 1001, 2:2–3, 2:38–40; Ex. 2016, Abstract. Using prior years' information was known. Ex. 1006, 8:20–35. Substituting acquisition of that data by satellite for aerial photography would have been an obvious substitution of different methods. Ex. 1009 ¶ 69.

Accordingly, we conclude that the Petitioner has shown that all of the features of claim 17 are disclosed in Hauwiller and the prior art described in the Background of the '867 patent, and that there would have been adequate reason to combine those teachings.

*e. Claims 20–23*

Claim 20 defines the soil nutrient to be applied as “nitrogen, phosphorous, or potassium.” Ex. 1001, 12:34–35.

Claim 21 defines the soil nutrient to be applied as “organic fertilizer or manure.” Ex. 1001, 12:36–37.

Claim 22 defines the soil nutrient to be applied as “a micronutrient.” Ex. 1001, 12:34–35.

Claim 23 defines the soil nutrient to be applied as “Zn or Fe.” Ex. 1001, 12:40–41.

Petitioner asserts that adding each of these listed nutrients to a crop was known at the time of the invention. Pet. 56, citing Ex. 1009 ¶¶ 93, 95, and 97, in turn citing to Ex. 1006, 17:36–40; 1:22–26. We agree.

Patent Owner does not offer any persuasive argument or evidence to the contrary.

Accordingly, we conclude that the Petitioner has shown that all of the features of claims 20-23 are disclosed in Hauwiller and the prior art described in the Background of the '867 patent, and that there would have been adequate reason to combine those teachings.

*2. Claim 18 – Hauwiller et al.  
in view of the Background of the '867 Patent, and  
further in view of Dickson et al.*

Claim 18 depends from claim 15 and recites “calculating, from a map of site-specific image data taken of the field during one or more past growing seasons, a map of site-specific measures of a vegetation index, the vegetation index serving as a measure of biomass produced by the field.” Petitioner argues that claim 18 is unpatentable under 35 U.S.C. § 103(a) over Hauwiller in view of the Background of the '867 patent and Dickson. Pet. 43–44.

Dickson describes an imaging system for determining nitrogen levels in vegetation. Ex. 1003 ¶ 29. The imaging system detects light from the vegetation and non-vegetation background at a plurality of wavelengths, such as near infrared, red, and green. *Id.* ¶ 31. A vegetation image is produced by separating out the non-vegetation portions using the characteristics of light reflected at the near infrared and red wavelength ranges. *Id.* ¶ 34. “The preferred embodiment calculates a normalized difference vegetative index (NDVI) as an index value to separate the

vegetation pixels from non-vegetation pixels.” *Id.* ¶ 57. The vegetation image is then analyzed based on the green wavelength range to determine the nitrogen status of the crop. *Id.* ¶ 35. The image analysis can evaluate crop status in other ways also, such as plant population and percent canopy measurements. *Id.* ¶ 61.

As with claim 16, discussed above, Petitioner refers to the statement in the Background of the ’867 patent that “[a] measure of ‘biomass,’ which is basically the density or amount of plant-life, is known to be directly related to crop yield.” Pet. 43 (quoting Ex. 1001, 1:61–63) (emphasis omitted). Petitioner asserts that Dickson teaches generating a vegetation map from measures of a vegetative index, and using the resulting vegetation image to determine the amount of plant life. *Id.* at 43–44 (citing Ex. 1003 ¶¶ 57, 61). Petitioner contends that, based on Dickson and the Background of the ’867 patent, it would have been obvious to use NDVI measurements as a measure of biomass “because NDVI is a known way to measure biomass and is a simple substitutable alternative to using leaf area index.” *Id.* at 44.

Patent Owner, on the other hand, asserts that there was no motivation to combine Hauwiller, Background, and Dickson. PO Corr. Resp. 40. More specifically, Patent Owner contends that Dickson does not provide any measure of biomass, only describing an imaging system which yields pixels of “vegetation” or “non-vegetation.” Dickson does not relate to pre-planting fertilization, but is real-time for use during the growing season. *Id.* at 41. Dr. Heiniger testifies that Dickson is to provide corrective fertilization during the same growing season. Ex. 2033 ¶ 204. Moreover, according to

Dr. Heiniger, NDVI does not measure biomass, as it discards certain plant data. *Id.* ¶ 205.

Patent Owner is misfocusing the patentability analysis. The Dickson method need not be bodily imported into Hauwiller. *See, e.g., In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (“The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference . . . . Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.”).

We find Petitioner’s contentions more persuasive. NDVI is a known alternative which could be used to measure the vegetation present in a field. As discussed above, using prior year field data was also known, as was the use of satellite imagery. Patent Owner again urges that this fails to teach biomass. PO Corr. Resp. 42. More specifically — Patent Owner argues that the combination of Hauwiller, Background, and Dickson does not render obvious “calculating, from a map of site-specific image data taken of the field during one or more past growing seasons, a map of site-specific measures of a vegetation index, the vegetation index serving as the measure of biomass produced by the field,” as recited in claim 18. PO Corr. Resp. 42.

However, each of these elements was individually known in the field of high precision farming — taking satellite data, using prior years’ data, using biomass, and using a vegetation index in order to learn about the field characteristics.

Petitioner has also articulated a persuasive reason, supported by rational underpinnings, why it would be obvious to combine those teachings

in the manner recited in claim 18. See Pet. 44 (“NDVI . . . is a simple substitutable alternative to using leaf area index”); Ex. 1009 ¶ 76 (“One of skill in the art would have thought to combine NDVI with the teachings of Hauwiller et al. because it would provide a fast and efficient way to develop site-specific values of yield and, thus, provide a fast and efficient way to develop nutrient amounts.”).

For these reasons, Petitioner has shown that all of the features of claim 18 are disclosed in Hauwiller, the prior art described in the Background of the ’867 patent, and Dickson.

*3. Claims 24 and 25 – Hauwiller in view of  
the Background of the ’867 patent and Shibusawa.*

Petitioner argues that claims 24 and 25 are unpatentable under 35 U.S.C. § 103(a) over Hauwiller in view of the Background of the ’867 patent and Shibusawa. Pet. 44–46.

Claims 24 and 25 depend from and further limit claim 15.

Claim 24 recites the additional steps of:

calculating for the field, from a map of site-specific image data taken of the field in a bare soil state, a map of site-specific measures of soil brightness; and

calculating the site-specific measures of the soil nutrient existing in the field from at least the map of site-specific measures of soil brightness.

Claim 25 recites the additional limitation that “the site-specific measures of the soil nutrient existing in the field are calculated from at least a map of site-specific measure of soil electrical conductivity.” Ex. 1001, 12:43–53.

Shibusawa describes an apparatus and method for measuring soil properties. Ex. 1004, 3:3–11. A soil map that correlates the soil properties

at each position can be created, which can be used for precise field management. *Id.* at 4:14–22.

Regarding claim 24, Petitioner argues that Shibusawa teaches that there is a correlation between soil brightness and organic matter in soil. Pet. 46 (citing Ex. 1004, 28:1–6). Petitioner cites Dr. Johannsen’s testimony that it was known in the art that the amount of organic matter content in the soil is the best estimate of nitrogen content. *Id.* (citing Ex. 1009 ¶ 78).

Regarding claim 25, Petitioner argues that Shibusawa discloses a map of measurements of soil electrical conductivity. Pet. 45–46 (citing Ex. 1004, 20:11–16, 23:14–17). Petitioner contends that it was known that electrical conductivity reflects soil moisture, the amount of organic matter in the soil, and therefore the amount of nutrients present. *Id.* (citing Ex. 1009 ¶ 79). In support of Petitioner’s contentions that claims 24 and 25 are obvious, Petitioner also articulates a reason why it would have been obvious to combine the cited references as claimed. *Id.* at 46 (arguing that using soil brightness from soil images would allow information to be captured for a large area without the need for individual soil tests).

In response, Patent Owner argues there is no motivation to combine the references. PO Corr. Resp. 46. Dr. Heiniger testifies that purchasing the system would be too expensive and the system would be less accurate, and that a sensor driven around a field looking under the soil is not a remote sensor. PO Corr. Resp. 47 (citing Ex. 2033 ¶¶ 240, 237, and 137–38).

Patent Owner also urges that organic material in the soil is not the best estimate for determining nitrogen content. PO Corr. Resp. 49. Patent Owner likewise challenges the description of the claim element of calculation of soil elements existing in the field from the electrical

conductivity of the field. PO Corr. Resp. 50. This is also said to be so because Shibusawa describes directly computing the soil nutrients, and electrical conductivity in isolation does not predict soil moisture. *Id.* at 51.

Petitioner's argument that because the use of organic matter content to estimate nitrogen content was known, it would have been obvious to use soil brightness as claimed in claim 24 to carry out the claimed nitrogen fertilization calculations, to us, carries more weight. Pet. 46. Petitioner's argument is supported by objective evidence. . Shibusawa, for example, acknowledges the role of organic material and fertilizers in yield increase. Ex. 1004, 1:23–27. Hauwiller emphasizes that organic matter is considered along with nutrient levels as important for a given crop. Ex. 1006 6:5–7. While not necessarily the “best” estimate, their use together was shown by Petitioner to be known.

Accordingly, we conclude that Petitioner has shown that all of the features of claim 24 are disclosed in Hauwiller, the prior art described in the Background of the '867 patent, and Shibusawa, and that there would have been adequate reason to combine those teachings.

However, Petitioner does not provide sufficient evidence or argument showing that it was known to use satellite imaging to produce a site-specific map of soil electrical conductivity. Dr. Johannsen's testimony concerning claim 25 states that “electrical conductivity of soil is commonly known as a soil property that can be measured” (Ex. 1009 ¶ 80), but does not address whether it was known or obvious to create a map of soil electrical conductivity through satellite imaging. We are therefore unpersuaded that making a map of soil conductivity by remote sensing is rendered obvious, as Petitioner has not adequately explained how soil conductivity could be

sensed remotely. Accordingly, we do not find that Petitioner has established a persuasive case of obviousness for claim 25. Pet. 47.

*4. Claims 1–5, 8–12, and 19 – Hauwiller in view of the Background of the '867 patent and Blackmer*

Petitioner argues that claims 1–5, 8–12, and 19 are unpatentable under 35 U.S.C. § 103(a) over Hauwiller in view of the Background of the '867 patent and Blackmer. Pet. 48–54.

*a. Summary of Blackmer (Ex. 1005)*

Blackmer is directed to methods of spatial evaluation of field characteristics including crop performance and environmental conditions. Ex. 1005, 1:8–12. Blackmer notes that genetic crop type can greatly affect yield because certain genetic crop types are particularly suitable for certain conditions. *Id.* at 1:36–42. “Yields can therefore be maximized if farmers can evaluate and control genetic crop performance on a small scale.

However, traditional analysis of crop performance [is] confounded by genotype by environment (GxE) variance . . . .” *Id.* at 1:46–50.

Specifically, in previous efforts to evaluate genetic performance of a crop, environment varied significantly enough, even within a single field, that crop performance information was of little use due to GxE variation. *Id.* at 2:1–3. Blackmer sought to address the need for a method that permitted comparisons between environmentally homogenous regions. *Id.* at 2:3–5.

Blackmer describes “a technique for the cell (length unit) based comparison of field characteristics.” *Id.* at 5:67–6:1. According to Blackmer, the method it teaches allows a smaller area of comparison and permits production of data maps for commercial agricultural production fields. *Id.* at 6:1–8. As part of Blackmer’s process, “after a field has been

prepared, spatially-referenced field characteristic data is obtained.” *Id.* at 6:66–67.

For example, the field characteristic data may simultaneously comprise measurements of an environmental condition variable and a crop performance variable. In this way, crop performance can be measured as a function of the environmental conditions, giving valuable new information that will allow a farmer to maximize yields.

*Id.* at 7:1–7. Field characteristic data can include “an environmental condition variable, including . . . information concerning watering or rainfall levels (to evaluate moisture dependency and drought hardiness) . . . .

Alternatively, the field characteristic data may comprise crop performance data such as moisture content . . . .” *Id.* at 7:20–35. Blackmer explains that “[a] correlation also may be calculated between an environmental condition variable and the crop performance variable. This will provide information regarding the performance of a crop under various conditions, thus allowing farmers to maximize crop production.” *Id.* at 3:60–64.

*b. Analysis of Claims 1–5*

Petitioner contends that the limitations that claim 1 shares in common with claim 15 are rendered obvious by Hauwiller in view of the Background of the ’867 patent for the same reasons as discussed above. *See* Pet. 47–48. Petitioner states that neither Hauwiller nor the Background of the ’867 patent disclose using a map of site-specific measures of a soil wetness index as recited in claim 1, but that doing so would have been obvious in view of Blackmer. *See id.* at 49. In particular, Petitioner asserts that Blackmer teaches to obtain field characteristic data, including soil moisture. *Id.* at 50 (citing Ex. 1005, 7:21–33, 28:13–16).

Citing the testimony of Dr. Johannsen, Petitioner argues that wetness index is a conventional way to characterize a location's moisture. *Id.* at 50–51 (citing Ex. 1009 ¶ 85). Further, Petitioner asserts that Blackmer discloses correlating the field characteristic with yield to maximize crop production. *Id.* at 51 (citing Ex. 1005, 3:60–67). Petitioner contends that it would have been obvious to combine Blackmer's soil moisture mapping procedures with Hauwiller because doing so “would allow for placement of fertilizer in areas more likely to have higher yields due to the presence of moisture.” *Id.* at 49.

Patent Owner counters that there is no motivation to combine Hauwiller, Background, and Blackmer. PO Corr. Resp. 52. Dr. Heiniger testifies that higher moisture does not necessarily indicate higher yields. Ex. 2033 ¶ 253. Patent Owner also contends that Blackmer is incongruent with Hauwiller. PO Corr. Resp. 53. This is said to be so because Hauwiller tests physical soil samples and Blackmer analyzes environmental conditions. *Id.* Patent Owner then concludes one of ordinary skill in the art would not have combined a reference related to fertilizer application with one which is not. *Id.* at 54. Patent Owner additionally asserts that Blackmer fails to describe a soil wetness index as recited in the claims. *Id.*

We are persuaded by Dr. Johannsen's testimony that wetness index is a conventional way to characterize a location's moisture. Ex. 1009 ¶ 82; *see also id.* ¶ 58. This testimony is supported by the citation in the '867 patent to a 1993 journal article as the source of the wetness index equation. Ex. 1001, 9:62–63. We understand Patent Owner's argument and Dr. Heiniger's testimony to the contrary that a soil wetness index was “not well-known at the time of the invention.” PO Corr. Resp. 55, citing Ex. 2033 ¶¶ 251–253,

266. We find the objective evidence to overcome this argument and testimony.

Accordingly, Petitioner has shown that calculating a wetness index would have been an obvious alternative to directly measuring soil moisture. Accordingly, Petitioner has shown that all of the features of claim 1 are disclosed in Hauwiller, the prior art described in the Background of the '867 patent, and Blackmer, and that there would have been adequate reason to combine those teachings.

Claims 2–5 depend from claim 1 and recite specific types of soil nutrients.

Claim 2 defines the soil nutrient to be applied as “nitrogen, phosphorous, or potassium.” Ex. 1001, 10:64–65.

Claim 3 defines the soil nutrient to be applied as “organic fertilizer or manure.” Ex. 1001, 10:66–67.

Claim 4 defines the soil nutrient to be applied as “a micronutrient.” Ex. 1001, 11:1–2.

Claim 5 defines the soil nutrient to be applied as “Zn or Fe.” Ex. 1001, 10:3–4.

Petitioner asserts that adding each of these listed nutrients to a crop was known at the time of the invention. Pet. 55–57, citing Ex. 1009 ¶¶ 93, 95, and 97, in turn citing to Ex. 1006, 17:36–40; 1:22–26. We agree.

Patent Owner does not offer any persuasive argument or evidence to the contrary. Based on the record before us, we find Petitioner’s contentions persuasive.

For these reasons, Petitioner has shown that all of the features of claims 2–5 are disclosed in Hauwiller, the prior art described in the

Background of the '867 patent, and Blackmer, and that there is adequate reason to combine those teachings.

*c. Analysis of Claims 8–12*

Independent claim 8 is directed to a computer program having instructions for causing a computer to carry out a process very similar to that required by claim 1. Both Petitioner and Patent Owner present the same arguments regarding claim 8 as for claim 1. *See* Pet. 49–51; Prelim. Resp. 55; PO Corr. Resp. 57. Thus, for the reasons discussed above regarding claim 1, we find Petitioner's contentions persuasive.

Claims 9–12 depend from claim 8 and recite specific types of soil nutrients. Petitioner presents the same arguments for these claims as were presented for claims 20–23. *See* Pet. 53. For the reasons discussed above, based on the record before us, we find Petitioner's argument and evidence persuasive. Patent Owner has not provided countervailing argument.

Accordingly, Petitioner has shown that all of the features of claims 8–12 are disclosed in Hauwiller, the prior art described in the Background of the '867 patent, and Blackmer, and that there would have been adequate reason to combine those teachings.

*d. Analysis of Claim 19*

Claim 19 depends from claim 15 and recites “calculating, from a topographic map for the field, a map of site-specific measures of a soil wetness index, the wetness index serving as the field characteristic.” Petitioner presents similar arguments for this claim as for claims 1 and 8, discussed above. *See* Pet. 51–53.

Regarding the claim 19 limitation that the wetness index is calculated “from a topographic map for the field,” which does not appear in claims 1 or

8, Petitioner cites testimony of Dr. Johannsen that field topography has a well-known correlation with wetness, and that it would have been obvious to use a topographic map to calculate wetness index because doing so avoids the need for aerial or satellite imaging or soil testing. Pet. 52 (citing Ex. 1009 ¶ 58).

Patent Owner relies on the same arguments regarding claim 19 as for claims 1 and 8. See Prelim. Resp. 42–43, 55; PO Corr. Resp. 54.

On the objective evidence of record, we therefore conclude that Petitioner has shown that all of the features of claim 19 are disclosed in Hauwiller, the prior art described in the Background of the '867 patent, and Blackmer, and that there would have been adequate reason to combine those teachings.

*5. Claims 6, 7, 13, and 14 – Hauwiller, Background, Shibusawa, and Blackmer*

Petitioner argues that claims 6, 7, 13, and 14 are unpatentable under 35 U.S.C. § 103(a) over Hauwiller in view of the Background of the '867 patent, Shibusawa, and Blackmer. Pet. 53–55. These claims recite similar subject matter as claims 24 and 25, and both Petitioner and Patent Owner present the same arguments for claims 6, 7, 13, and 14 as for claims 24 and 25. Pet. 53–55; Prelim. Resp. 55; PO Corr. Resp. 58.

For the reasons discussed above, we conclude that Petitioner has shown that all of the features of claims 6, 7, 13, and 14 are disclosed in Hauwiller, the prior art described in the Background of the '867 patent, Shibusawa, and Blackmer, and that there is adequate reason to combine those teachings. The deficiency in Petitioner's case against claim 25 discussed in Section II.C.3. does not apply to any of claims 6, 7, 13, and 14

because none of these claims (or any of the claims from which they depend) requires use of a satellite image to generate a map of soil electrical conductivity.

#### *D. Secondary Considerations*

Factual inquiries for an obviousness determination include secondary considerations based on evaluation and crediting of objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Notwithstanding what the teachings of the prior art would have suggested to a skilled artisan, the totality of the evidence submitted, including objective evidence of nonobviousness, may lead to a conclusion that the challenged claims would not have been obvious to one with ordinary skill in the art. *In re Piasecki*, 745 F.2d 1468, 1471–72 (Fed. Cir. 1984).

Secondary considerations, when present, must always be considered as part of an obviousness inquiry. *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling USA, Inc.*, 699 F.3d 1340, 1349 (Fed. Cir. 2012). Secondary considerations may include any of the following: long-felt but unsolved need, failure of others, unexpected results, commercial success, copying, licensing, and praise. *See Graham*, 383 U.S. at 17–18; *Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007).

To be accorded substantial weight, there must be a nexus between the merits of the claimed invention and the evidence of secondary considerations. *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995). “Nexus” is a legally and factually sufficient connection between the objective evidence and the claimed invention, such that the objective evidence should be considered in determining nonobviousness. *Demaco*

*Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988).

The burden of showing that there is a nexus lies with the Patent Owner. *Id.*; see *In re Paulsen*, 30 F.3d 1475, 1482 (Fed. Cir. 1994).

Here, Patent Owner argues that the licensing and acquisition history of the '867 patent supports the nonobviousness of the claimed invention. PO Resp. 58–59. Specifically, Patent Owner points to agreements that Petitioner entered with a previous owner of the '867 patent, which included licenses to the '620 patent. *Id.* (citing Exs. 2022, 2023, 2024). Patent Owner also asserts that its own acquisition of the '867 patent as part of a settlement of a patent infringement suit constitutes additional evidence of nonobviousness. *Id.* at 52 (citing Ex. 2026–27). Finally, Patent Owner argues that Petitioner's commercial success during the licensing period and Petitioner's acquisition by Land O'Lakes supports nonobviousness. *Id.* at 52 (citing Exs. 2028–30).

Petitioner responds that Patent Owner has not established a nexus between the licensing activity and the invention, as the agreements between Petitioner and the former owner of the '867 patent were entered for reasons other than recognition and acceptance of the subject matter claimed. Pet. Reply 14. Petitioner further contends that Patent Owner provides insufficient detail regarding the acquisition of the '867 patent to permit a determination that the acquisition related to the merits of the patented invention. *Id.* at 14–15. Petitioner also challenges Patent Owner's evidence of commercial success, arguing that “no consideration has been provided for other factors such as Geosys's global expertise, customer relationships,

technical expertise, the strength of its IT and workforce, or its own goodwill and other intellectual property.” *Id.* at 15.

We agree with Petitioner that Patent Owner has not shown the required nexus between the alleged objective indicia of nonobviousness and the merits of the claimed invention. Although the agreements between Petitioner and the former owner of the ’867 patent convey rights under the ’867 patent, they involve significantly more than the pertinent licenses. The 2008 and 2011 agreements convey licenses to a broader portfolio of U.S. and Canadian patents as well as copyrights, trademarks, and a domain name. Ex. 2022, 4–6; Ex. 2023, 4–6.

Moreover, the licenses to intellectual property are just one facet of these agreements, the primary purpose of which is “to set forth the terms upon which Geosys shall provide sales, marketing and support for Field InSite as part of the GeoSys FarmSat Platform.” Ex. 2022, 2; Ex. 2023, 2. Similarly, the 2012 agreement conveys rights beyond the ’867 patent. Ex. 2024, 2–3. Patent Owner does not point to, and we do not find, any portion of these agreements assigning a particular royalty rate or value for the ’867 patent. Given the breadth of the agreements and the absence of evidence or explanation from Patent Owner concerning nexus, any determination of how much of the value of the agreements is attributable to the ’867 patent would be speculative. *See In re Cree*, 818 F.3d 694, 703 (Fed. Cir. 2016).

Further, the 2012 agreement calls for a lump sum payment for all of the rights conveyed, the amount of which is less than a reasonable estimate of potential litigation costs. Ex. 2024, 2–3. This detracts further from Patent Owner’s argument that the agreements support the nonobviousness of the ’867 patent. *See EWP Corp. v. Reliance Universal Inc.*, 755 F.2d 898, 907–

08 (Fed. Cir. 1985) (noting that licensing programs “are not infallible guides to patentability. They sometimes succeed because they are mutually beneficial to the licensed group or because of business judgments that it is cheaper to take licenses than to defend infringement suits, or for other reasons unrelated to the unobviousness of the licensed subject matter.”).

Patent Owner’s argument based on its acquisition of the ’867 patent is also unpersuasive. The evidence that Patent Owner cites in support of that argument (Exs. 2025, 2026, 2027) shows only that The Mosaic Company filed and subsequently dismissed a Canadian patent infringement suit against Patent Owner. Patent Owner does not cite to the agreement by which ownership of the ’876 patent was transferred, nor does Patent Owner provide the details of that agreement. The evidence Patent Owner relies on does not support Patent Owner’s argument that its decision to acquire the ’867 patent constitutes objective evidence of nonobviousness of the ’867 patent.

Finally, the commercial success argument Patent Owner presents in a single sentence at the end of its brief is undeveloped and unpersuasive. *See* PO Resp. 59. Patent Owner does not present evidence or argument sufficient to establish that any product of Petitioner’s embodying the ’867 patent was commercially successful, nor that the commercial success was due to the merits of the claimed invention.

We have considered the record evidence before us, and conclude that, on balance, Petitioner’s evidence of obviousness outweighs the evidence of secondary considerations of nonobviousness submitted by Patent Owner. Accordingly, we conclude that Petitioner has established by a preponderance of the evidence that claims 1–24 are unpatentable as obvious under 35 U.S.C. § 103.

*E. Patent Owner's Motion to Exclude Evidence*

Patent Owner moves to exclude Exhibits 1014–17. Paper 24, 1. This Decision does not rely upon any of the content that Patent Owner seeks to exclude. Accordingly, we *dismiss as moot* Patent Owner's Motion to Exclude.

*F. Patent Owner's Motion to Seal*

Patent Owner filed a motion to seal Exhibits 2022–24 pursuant to 37 C.F.R. § 42.54. Paper 12. The exhibits that Patent Owner seeks to have sealed are license agreements, the content and terms of which Patent Owner represents are confidential and commercially sensitive. *Id.* at 1–2. In support of its motion, Patent Owner submitted a Proposed Protective Order, to which both parties have agreed. *See id.* at 3; Ex. 2034. Patent Owner represents that the Proposed Protective Order is identical to the default protective order in the Office Patent Trial Practice Guide except that it additionally states that the protective order may be superseded by agreement of the parties and approval of the Board. *See id.*; Ex. 2035, 1.

There is a strong public policy in favor of making information filed in an *inter partes* review open to the public, especially because the proceeding determines the patentability of claims in an issued patent and, therefore, affects the rights of the public. Under 35 U.S.C. § 316(a)(1) and 37 C.F.R. § 42.14, the default rule is that all papers filed in an *inter partes* review are open and available for access by the public; however, a party may file a concurrent motion to seal and the information at issue is sealed pending the outcome of the motion.

It is only “confidential information” that is protected from disclosure. 35 U.S.C. § 316(a)(7); *see* Office Patent Trial Practice Guide, 77

Fed. Reg. 48,756, 48,760 (Aug. 14, 2012). The standard for granting a motion to seal is “good cause.” 37 C.F.R. § 42.54(a). The party moving to seal bears the burden of proof in showing entitlement to the requested relief, and must explain why the information sought to be sealed constitutes confidential information. 37 C.F.R. § 42.20(c). As set forth in the Trial Practice Guide (77 Fed. Reg. at 48,761), there is an expectation that information will be made public if identified in this Final Written Decision.

We have reviewed the exhibits at issue and find that Patent Owner has made a sufficient showing that they contain confidential information and that there exists good cause to have those exhibits remain under seal. Accordingly, we enter the Protective Order submitted as Exhibit 2034 and grant Patent Owner’s motion to seal.

The record will be maintained undisturbed pending the outcome of any appeal taken from this decision. At the conclusion of any appeal proceeding, or if no appeal is taken, the documents will be made public. *See* Trial Practice Guide, 77 Fed. Reg. at 48,760–61. Further, either party may file a motion to expunge the sealed documents from the record pursuant to 37 C.F.R. § 42.56. Any such motion will be decided after the conclusion of any appeal proceeding or the expiration of the time period for appealing.

### III. CONCLUSION

We conclude that Petitioner has shown by a preponderance of the evidence that claims 1–24 would have been obvious to one of ordinary skill in the art at the time the invention was made. We do not conclude that Petitioner has made such showing with respect to claim 25.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–24 of the '867 patent are held unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Seal (Paper 12) is *granted*;

FURTHER ORDER that Patent Owner's Motion to Exclude Evidence (Paper 24) is *dismissed as moot*; and

FURTHER ORDERED that, because this is a Final Written Decision, the parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

PETITIONER:

Brett Klein  
Devan Padmanabhan  
Michelle Dawson  
Erin Dungan  
Winthrop & Weinstine  
patent@winthrop.com

IPR2015-00711  
Patent 7,343,867 B2

PATENT OWNER:

Darren Donnelly  
Andrew Whitehead  
Dargaye Churnet  
Stuart Meyer  
Amy Hayden  
Fenwick & West LLP  
ddonnelly-ptab@fenwick.com  
awhitehead-ptab@fenwick.com  
dchurnet@fenwick.com  
smeyer@fenwick.com  
ahayden-ptab@fenwick.com