



**Figure 3.** Grain yield of spring wheat and net profit as affected by crop management technology in on-farm research experiment conducted in 2007 at the agricultural enterprise's field in Stavropol District, Samara Oblast (Tsirulev, 2008). Treatments:

- 1 - Extensive technology without fertilizer use (control)
- 2 - Ordinary technology (average fertilizer practice)
- 3 - Ordinary technology with GPS navigation
- 4 - Intensive technology (fertilizer rates calculated using the balance method)
- 5 - Intensive technology with GPS navigation and variable rate fertilizer application

application in the 5th treatment were the most efficient in increasing grain yield of spring wheat (to 2.05 t/ha) compared to other technologies studied in the experiment. The benefit of crop management under precision agriculture technologies was uniform (without gaps and overlaps) application of mineral fertilizers and plant protection inputs on the experimental field. At the same time, areas with lodging of spring wheat were observed in plots receiving the treatment with intensive crop management technology, but without GPS navigation. This was because of overlap in applying broadcast N fertilizer (**Figure 4**).

Net profit was highest for the 5th treatment (3,638 RUB/ha) where precision agriculture approaches were used, and exceeded by 11% the net profit for the 4th treatment (3,264 RUB/ha) when fertilizer rates were calculated using the balance method based on the average available P and K content in the soil (**Figure 3**). The measurement of spatial variability in available P and K indicated areas with high or very high levels for both nutrients, which for the 5th treatment did not require P and K fertilizer application according to the standard soil fertility classes. Thus, fertilizer expenses decreased by 9%



**Figure 4.** Lodging of spring wheat in treatment No. 4 under intensive technology without GPS navigation. Overlap in applying broadcast N fertilizer resulted in lodging.

(from 1,552 to 1,411 RUB/ha) compared to the 4th treatment where fertilizer rates were calculated by the balance method based on the analysis of a mixed soil sample from a large area.

It may be concluded, therefore, that measurement of the spatial heterogeneity of soil fertility factors enabled more precise agrochemical analysis of arable fields compared to the routine approach widely used in soil fertility surveys. Variable rate fertilizer application, moreover, considerably increased the efficiency of mineral fertilizer use. It is important to note that the application of fertilizers at average rates based on the traditional soil sampling method may result in both under- and over-fertilization on some parts of the field. The latter factor may have a negative impact on the environment. **DC**

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## IPNI Introduces “Nutrient Source Specifics” Series

IPNI has introduced a new series of one-page, condensed fact sheets highlighting common fertilizers and nutrient sources in modern agriculture. The series is called “Nutrient Source Specifics”.

“These topics offer brief information about the production, agricultural use, management practices, and chemical properties of common fertilizer materials,” said IPNI President Dr. Terry L. Roberts. “One of our thematic work groups saw the need for this kind of information and we believe the series format will be useful in providing a quick reference library as we add to it. However, we also encourage individuals to consult with local experts regarding specific nutrient use.”

One of the goals of IPNI is to provide science-based plant nutrient and fertilizer information to a wide range of audiences.



Written by IPNI scientific staff, Nutrient Source Specifics topics are primarily for educational use by a non-technical audience. The list of topics currently consists of: 1) urea; 2) polyphosphate; 3) potassium chloride; 4) compound fertilizer; 5) potassium sulfate; 6) potassium magnesium sulfate; langbeinite; 7) urea-ammonium nitrate; 8) thio sulfate; 9) monoammonium phosphate (MAP); and 10) ammonia.

The series will be available as individual PDF files at the IPNI website: [www.ipni.net/specifics](http://www.ipni.net/specifics).