ABSTRACT  Quality has become an essential attribute of agricultural products and production processes in particular as a result of European Commission Regulations. Moreover, sorting of grain based on protein concentration could enable growers to realise price premiums in value-added markets. The variability of soils, topography and fertility are known to influence grain yield and quality. Interdependency of these factors has also been considered as limitation for site-specific nitrogen management strategies. The aim of this collaborative research project is to monitor protein concentration variability and to segregate grain into quantities of high or low protein content on a combine harvester. Near-infrared spectrometry (NIRS) was used to determine protein concentration of winter wheat and spring barley in both diffuse reflection and diffuse transmission in field trials in Brandenburg and Thuringia. Performance characteristics were obtained during the 2008 and 2009 field trials, a total of 300 ha of wheat and 60 ha of barley were harvested. Protein predictions correlated well with reference measurements (Barley: $R^2 = 0.94$, SEP = 0.31 %; Wheat: $R^2 = 0.96$, SEP = 0.33 %). Deviations of NIRS analysis results beyond the calibration error were logged constantly and helped to ensure correct grain tank filling. Process data were also classified using principal component analysis (PCA), the prediction range of protein values, their standard deviation as well as the hotelling T2-statistics. Segregation results are accurate and promising for implementation as a tool to improve grain marketing. The results are sufficiently promising to suggest that monitoring of grain properties and segregation of grain according to defined quality parameters are technically feasible on an operating combine harvester.

Keywords: NIRS, On-Combine Monitoring and Sorting, Protein Concentration.