Fermented sausages are considered a noble meat industry product, mostly due to the incalculable added value over the raw material. However, because presenting a fat content that can reach up to 50%, its consumption is not recommended as part of a healthy diet because a decrease in fat intake is indicated by public health authorities as a way to prevent the occurrence of cardiovascular disease, which is the leading cause of death in developed countries. In this study, fermented sausages were produced with a reduction of 15% to 10% in pork back fat in the formulation and soy fiber addition (1% and 2%). During manufacturing, the physicochemical and microbiological parameters were assessed. The final products were submitted to a consumer study, and volatile compounds were extracted by solid-phase microextraction and analyzed by GC/MS. The modified fermented sausages presented a final fat reduction of nearly 40%. There was no change in the manufacturing process. However, an addition of 2% soy fiber detracted from the sensory quality. Volatile compounds from lipid oxidation were reduced, and volatile compounds from carbohydrate and amino acid catabolism were increased in the modified fermented sausages. To conclude, fermented sausages with healthier characteristics can be produced without quality loss by reducing pork back fat from 15% to 10% and by adding 1% soy fiber.