Principal Component Analysis (PCA)

The principal component analysis (PCA) was used to analyse the relationship among samples and the nutritional attributes from the pasta samples and it was implemented to investigate correlations and find possible differentiates of sample characteristic. For the development of the PCA, the raw data were standardized and the number of PCs was chosen according to the eigenvalue higher than 1. The first principal component displayed more than 48% of the systematic variation in the data. The second principal component represents the 26.13% extra variation and the third principal component explain 13.24% of the variance. PCA on the nutritional composition data of the cooked (PC-) and uncooked (P-) samples showed that three principal components explain more than 87% of the total variance. The results of the PCA of nutritional evaluation showed that the samples could be assigned into 4 groups according to the properties studied (Figure S2). PC1 separated the legumes enriched pasta into two clusters of low or high legumes content, and PC2 did the same between cooked (PC-) and uncooked (P-) pasta. The PC1 against PC2 scores plot, presented a clear distinction between the spectra of the different formulations of cooked and uncooked pasta, and the commercial control.

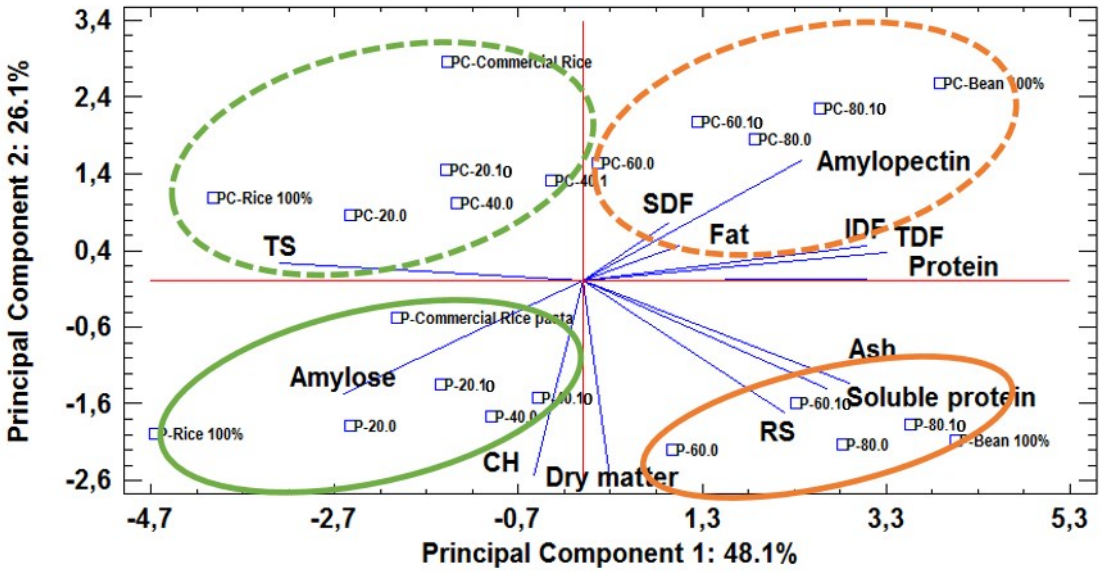

Figure S2. Principal components analysis (PCA) projection of two first principal components. P- (uncooked pasta), PC- (cooked pasta). Parameters: dry matter, ash, protein, fat, total carbohydrates (CH), soluble protein, total dietary fibre (TDF), insoluble dietary fibre (IDF), soluble dietary fibre (SDF), total starch (TS), resistant starch (RS), amylose and amylopectin.

PCA shows a clear distinction between the spectra of the different formulations. The group characterized by uncooked pasta with low bean percentage in the composition was negatively characterized by PC1 and PC2, instead, the group formed by uncooked pasta with 60, 80 or 100% bean in the formulation was positively characterized by PC1 and negatively characterized by PC2. In contrast, the cooked pasta PC- Commercial rice pasta, PC-Rice, PC-20.0, PC-20.10, PC-40.0 and PC-40.10 were characterized negatively by PC1 and positively by PC2. The rest of the cooked pastas were characterized positively by PC1 and PC2. PC3 separated the commercial rice pasta in a different cluster, this group was positively characterized by PC3 while the mainly experimental development pasta was negatively characterized by PC3 (Figure S3).

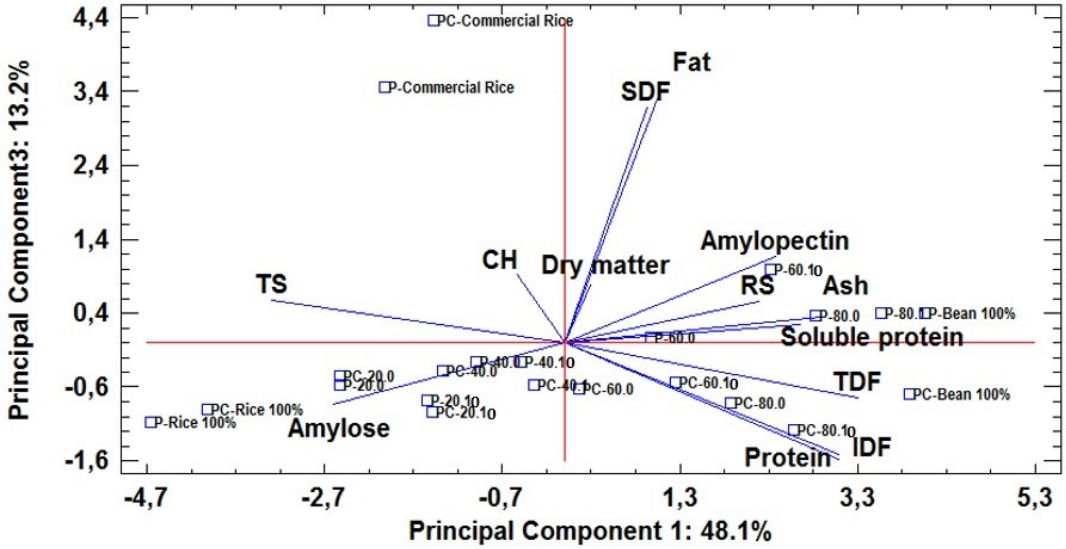

Figure S3. Principal components analysis (PCA) projection of the PC1 and PC3 principal components. P- (uncooked pasta), PC- (cooked pasta). Parameters: dry matter, ash, protein, fat, total carbohydrates (CH), soluble protein, total dietary fibre (TDF), insoluble dietary fibre (IDF), soluble dietary fibre (SDF), total starch (TS), resistant starch (RS), amylose and amylopectin.

The effect of the cooking process and the percentage of legumes in the formulation was revealed here using the PCA which was not significantly observed in each single analysis (e.g. fat and SDF determinations). Taking into account the results obtained, PC1 explained and represented the percentage of legumes in the experimental pasta while PC2 represented the different between cooked and uncooked pasta.

Total starch, protein, insoluble and total dietary fibre contribute to explain most of the variance of PC1. Dry matter, total carbohydrates, and resistant starch contributed to

explain the variance of PC2, while soluble dietary fibre and fat explained the variance of PC3.

Uncooked pasta with low legumes content were positively correlated to amylose, and negatively correlated to amylopectin, total, soluble and insoluble dietary fibre, fat and protein content. However, cooked samples with low legumes content were positively correlated to total starch content and mainly negatively correlated to resistant starch and soluble protein. Uncooked samples with high legume content were negatively correlated to starch content and positively correlated to resistant starch, soluble protein and ash. Cooked samples with high legume percentage were positively correlated to amylopectin, fat and total, soluble and insoluble dietary fibre contents.