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| **Title:** *(Use Normal style (Times New Roman 12). Only capitalise the first letter of the first word. No full stop at the end of the title)* |
| Effect of offering concentrates with differing human edible fractions on dairy cow performance |
| **Summary:** *(Your summary (Times New Roman 10) must use Body text style and must not be longer than this box)* |
| **Application** The human edible fraction of the diet of mid lactation dairy cow can be successfully reduced without negatively impacting on energy corrected milk yield**Introduction** A growing world population and unavailability of arable land for agricultural expansion may threaten global food security in the coming decades. It has been suggested that making greater use of human inedible feeds in dairy cow rations would release more land for human food production and also reduce food wastage. A previous study by Munnich et al. (2018) examined the impact of substituting individual grains with by-product feeds on milk production. The current study was designed to examine the effects of replacing cereal grains and soyabean meal with by-product feeds on milk production and feed efficiency of dairy cows offered a grass silage based diet**Materials and Methods** A two period changeover design study using 20 mid lactation cows (mean of 157 days calved) examined the effects of offering concentrate containing a high proportion of human edible ingredients (HE) or human inedible ingredients (HI). Both concentrates were formulated to be isoenergetic and isonitrogenous, while differing in their ingredient composition. HE contained significant quantities of cereals and soyabean meal, while the cereals and soyabean meal in HI were replaced with by-product feeds such as rapeseed meal and distillers dark grains. A common grass silage (mean DM, 375 g/kg; CP, 126 g/kgDM, metabolizable energy, 11.5 MJ/kgDM) was offered throughout the study as a partial mixed ration comprising 63 % grass silage and 37 % concentrate on a dry matter (DM) basis. Cows also received 0.25 kg/day of a commercial concentrate at each milking. Feed intakes, milk yields, milk composition and liveweights were recorded during the fourth week of each period. The human edible fraction of feeds was calculated using the methodology described by Wilkinson (2011). Feed conversion efficiency (FCE) was calculated for each treatment as kg energy corrected milk yield (ECM) per kg DM intake (DMI). Nitrogen (N) use efficiency (NUE) was estimated via milk N output as a proportion of total N intake. Edible feed conversion ratio (eFCR) was defined as human edible food output as a proportion of human edible food input per day. Net Food Production (NFP) was expressed as daily human edible output minus daily human edible input using the human edible fractions described by Ertl et al. (2015) under current standard extraction allowances**Results** The human edible fraction of HE and HI were estimated to be 0.54 and 0.18 respectively. Cows offered HI had significantly higher total DMI than animals offered HE (P<0.05). There were no significant differences between the treatments in terms of ECM yield or liveweight. However animals offered HE produced milk with a higher milk fat and protein concentration than cows offered HI (P<0.001). While FCE and NUE were similar for both treatments, eFCR (energy) and NFP (protein) was higher among cows offered HI (P<0.001)**Table 1** Performance of cows offered concentrates high in either human edible or human inedible based ingredients.

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|  | Human edible concentrate | Human inedible concentrate | SED | P-value |
| Total DMI (kg/day) | 19.9 | 20.6 | 0.21 | P<0.05 |
| ECM yield (kg/day) | 32.8 | 32.8 | 0.38 | 0.926 |
| Milk fat (g/kg) | 48.2 | 46.1 | 0.51 | P<0.001 |
| Milk protein (g/kg) | 36.3 | 34.8 | 0.24 | P<0.001 |
| Liveweight (kg) | 640 | 643 | 3.6 | 0.461 |
| FCE | 1.65 | 1.61 | 0.026 | 0.149 |
| NUE | 0.35 | 0.34 | 0.006 | 0.119 |
| eFCR (energy) | 1.26 | 3.36 | 0.011 | P<0.001 |
| NFP (protein) (g/cow/day) | 352 | 701 | 13.3 | P<0.001 |

**Conclusions** Mid lactation cows offered concentrates high in human inedible ingredients had similar ECM yield as cows consuming concentrates high in human edible ingredients. Human edible feed conversion efficiency improved with increased inclusion of human inedible ingredients in the concentrate.**Acknowledgments** This project was funded by Department of Agriculture, Environment and Rural Affairs (DAERA).**References**Ertl, P., Klocker, H., Hortenhuber, S., Knaus, W. and Zollitsch, W. (2015). Agricultural Systems, 137: 119-125Münnich, M., Klevenhusen, F. and Zebeli, Q. (2018). Animal Feed Science and Technology, 241: 75-83Wilkinson, J.M. (2011). Animal, 5: 1014-1022 |