Supplementary Material -**Managing the transition from purebred to rotational-crossbred dairy cattle herds: three technical pathways from a retrospective case-study analysis**

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Table S1 Structure and content of the interview guide on crossbreeding management in the dairy cattle farms sampled

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| Topic of  the interview guide | Collected data (for each section) | Selected encoded variable |
| Breeding management | Breeds, dairy crossbreeding schemes, percentage of crossbred in the herd, selection criteria for crossbred mating, mating season, mating methods1, selection criteria for bulls, dairy crossbred mating, crossbred mating with beef breeds, age at first calving | V1: Changes in dairy crossbreeding scheme  V2: Changes in dairy crossbred mating  V3: Changes in mating season  V4: Changes in the number of bulls used for mating  V5: Changes in mating method  V6: Changes in percentage of crossbred mating with beef breeds |
| Replacement management | Selection criteria for replacement, replacement rate2, purchase of heifers, sale of heifers | V7: Changes in replacement rate  V8: Changes in purchase of heifers  V9: Changes in sale of heifers  V10: Changes in selection criteria for replacement |
| Culling management | Selection criteria for culling, culling rate | V11: Changes in selection criteria for culling |

1 Mating methods: artificial insemination *vs.* natural mating;

2 Replacement rate is calculated by dividing number of primiparous females with number of dairy cows

Table S2 Classes of the 10 supplementary variables (SVi.j, i = 1-10 and j = 1-4) to describe the changes in general characteristics or practices of the dairy cattle farms sampled

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| --- | --- |
| Supplementary variable | Class of the variable |
| SV1 Major dairy crossbreeding scheme | SV1.1 Procross1 scheme  SV1.2 Normande or Simmental breeds-based scheme  SV1.3 Jersey breed-based scheme |
| SV2 Breed of sire used on PB2 cows | SV2.1 Montbéliarde sire on PB2 cows  SV2.2 Normande or Simmental sire on PB2 cows  SV2.3 Viking Red or Swiss Brown sire on PB2 cows |
| SV3 Breed of sire used on F13 cows | SV3.1 Montbéliarde sire on F13 cows  SV3.2 Normande or Simmentale sire on F13 cows  SV3.3 Viking Red or Swiss Brown sire on F13 cows  SV3.4 Jersey sire on F13 cows |
| SV4 Breed of sires used on G24 cows | SV4.1 Holstein sire on G24 cows  SV4.2 Normande or Simmentale sire on G24 cows  SV4.3 Viking Red or Swiss Brown sire on G24 cows  SV4.3 Jersey sire on G24 cows |
| SV5 Evolution in farm size | SV5.1 Increase of Utilised Agricultural Area  SV5.2 Decrease of the Utilised Agricultural Area  SV5.3 Utilised Agricultural Area remained stable |
| SV6 Evolution in the percentage of grassland area | SV6.1 Increase in grassland area  SV6.2 Decrease in grassland area  SV6.3 Grassland areas remained stable |
| SV7 Evolution in the percentage of silage maize area | SV7.1 Increase in silage maize area  SV7.2 Decrease of silage maize area  SV7.3 Silage maize area remained stable |
| SV8 Evolution in herd size | SV8.1 Increase in herd size  SV8.2 Herd size remained stable |
| SV9 Evolution in milk yield per cow | SV9.1 Increase in milk yield per cow  SV9.2 Decrease in milk yield per cow  SV9.3 Stable milk yield per cow |
| SV10 Evolution in farming | SV10.1 Converted to OF before dairy crossbreeding  SV10.2 Conversion to OF after dairy crossbreeding  SV10.3 Conventional farming |

1 Procross is a 3-breed crossbreeding scheme: (HO x MO) x VR or (HO x VR) x MO

2 Purebred animal

3 First-generation crossbred animal

4 Second-generation crossbred animal