

**Table S2. QTLs and genes previously described within the regions associated with growth traits in simmental and simbrah cattle.**

| Model | Trait           | Chr <sup>a</sup> | Pos <sup>b</sup> | SNPs <sup>c</sup>      | QTLs <sup>d</sup>  | Genes <sup>e</sup>   |   |
|-------|-----------------|------------------|------------------|------------------------|--|--|---|
| Joint | BW <sup>f</sup> | 1                | 155,615,450      | ARS-BFGL-NGS-54653     | MILK: Milk fat yield (PUBMED_ID=22449276), Milk protein yield (PUBMED_ID=22449276);  | LOC101908237, LOC112448155, LOC112448186,  |   |
|       |                 |                  |                  |                        | PRODUCTION: Maturity rate (PUBMED_ID=26445451); REPRODUCTION: Conception rate SATB1 (PUBMED_ID=31718557)   |  |   |
|       |                 | 2                | 122,900,223      | BovineHD0200035799     | HEALTH: Bovine respiratory dise (PUBMED_ID=30229962); MILK: Milk kappa-casein perce  | LOC104971336, LOC112442418, LAPT5, MATN1 (PUBMED_ID=27485317), Milk zinc content (PUBMED_ID=25989905)  |   |
|       |                 | 6                | 111,363,016      | BovineHD0600033010     |  |  | LOC104968940, TAPT1, PROM1  |
|       |                 | 8                | 67,033,400       | ARS-BFGL-NGS-100986    | HEALTH: Bovine respiratory dise (PUBMED_ID=30229962); MILK: Milk casein percentage   | LOC100298923, LOC100848109, LOC784966, LPL (PUBMED_ID=28711251), Milk fat percentage (PUBMED_ID=28711251), Milk fat yield (PUBMED_ID=28711251), Milk protein percentage (PUBMED_ID=28711251), Milk protein-to-fat rat (PUBMED_ID=28711251) |   |
|       |                 | 9                | 94,143,252       | BovineHD4100007685     |  |  | ZDHHC14   |
|       |                 | 10               | 100,924,131      | ARS-BFGL-NGS-3343      |  |  | FOXN3   |
|       |                 | 11               | 92,059,776       | BovineHD1100026733     | HEALTH: Anti-Müllerian hormone (PUBMED_ID=30007805); PRODUCTION: Body weight (birth) (PUBMED_ID=30290764); REPRODUCTION: Conception rate (PUBMED_ID=31718557)  |  |   |
|       |                 | 12               | 58,592,180       | BovineHD1200016189     |  |  | TRNAC-GCA_157, LOC784127  |
|       |                 | 14               | 22,518           | BovineHD0600000008     |  |  | LOC100299844  |
|       |                 | 14               | 67,912,806       | BovineHD1400019721     |  |  | LOC112449543, PTDSS1, MTERF3, UQCRB   |
|       |                 | 15               | 83,228,283       | BovineHD1500024815     | REPRODUCTION: Conception rate (PUBMED_ID=27209127)   |  | MS4A3, LOC112441667, LOC112441666, LOC107133207, MS4A2, MS4A7, MS4A14, MS4A5, MS4A1 |
|       |                 | 17               | 63,950,062       | ARS-BFGL-BAC-36611     | MILK: 305-day milk yield (PUBMED_ID=29521460), Milk fat percentage (PUBMED_ID=29521460), Milk fat yield (PUBMED_ID=29521460), Milk protein percentage (PUBMED_ID=29521460), Milk protein yield (PUBMED_ID=21831322), Milk yield (PUBMED_ID=21831322); REPRODUCTION: Non-return rate (PUBMED_ID=29178833), Sire conception rate (PUBMED_ID=29486732), Sperm motility (PUBMED_ID=27610941) |  | ACACB, UNG, ALKBH2, USP30, SVOP   |
|       |                 | 20               | 48,820,669       | BovineHD2000013587     |  |  | LOC112443046, CDH10   |
|       |                 | 22               | 7,005,226        | Hapmap57734-rs29023397 | MEAT AND CARCASS: Lean meat yield (PUBMED_ID=25273628), Subcutaneous fat (PUBMED_ID=27221246); PRODUCTION: Dry matter intake (PUBMED_ID=23851991), Metabolic body weight (PUBMED_ID=23851991)  |  | LOC107131649, LOC514651, CMTM6, DYNC1L11  |

|                        |                                  |   |
|------------------------|----------------------------------|---|
| 23                     | 16,132,392 BovineHD2300004168    | CONFORMATION: Feet and leg conformati (PUBMED_ID=21831322), Foot angle LOC112443875, LOC112443876, LOC112443924, (PUBMED_ID=21831322), Rear leg placement - re (PUBMED_ID=21831322), Rear leg placement - si TRERF1 (PUBMED_ID=21831322), Stature (PUBMED_ID=21831322), Strength (PUBMED_ID=21831322), Teat length (PUBMED_ID=21831322); HEALTH: Somatic cell score (PUBMED_ID=21831322); MEAT AND CARCASS: Lean meat yield (PUBMED_ID=25273628); MILK: Milk fat percentage (PUBMED_ID=21831322), Milk fat yield (PUBMED_ID=21831322), Milk protein percentage (PUBMED_ID=21831322, 31139206), Milk protein yield (PUBMED_ID=21831322), Milk yield (PUBMED_ID=21831322); PRODUCTION: Body depth (PUBMED_ID=21831322), Net merit (PUBMED_ID=21831322), PTA type (PUBMED_ID=21831322); REPRODUCTION: Calving ease (PUBMED_ID=21831322), Calving ease (maternal) (PUBMED_ID=21831322)  |
| 26                     | 41,389,219 ARS-BFGL-NGS-27004    | CONFORMATION: Feet and leg conformati (PUBMED_ID=21831322), Foot angle FGFR2 (PUBMED_ID=21831322), Rear leg placement - re (PUBMED_ID=21831322), Stature (PUBMED_ID=21831322), Strength (PUBMED_ID=21831322), Teat length (PUBMED_ID=21831322), Udder attachment (PUBMED_ID=21831322), Udder depth (PUBMED_ID=21831322), Udder height (PUBMED_ID=21831322); MILK: Milk C16 index (PUBMED_ID=31563305), Milk fat percentage (PUBMED_ID=21831322), Milk fat yield (PUBMED_ID=21831322), Milk palmitoleic acid c (PUBMED_ID=31563305), Milk protein percentage (PUBMED_ID=21831322), Milk protein yield (PUBMED_ID=21831322); PRODUCTION: Body depth (PUBMED_ID=21831322), Body weight (yearling) (PUBMED_ID=19966163), Length of productive li (PUBMED_ID=21831322), Net merit (PUBMED_ID=21831322), PTA type (PUBMED_ID=21831322), Rump width (PUBMED_ID=21831322); REPRODUCTION: Calf size (PUBMED_ID=21183059), Calving ease (PUBMED_ID=21183059, 21831322), Calving ease (maternal) (PUBMED_ID=21831322), Stillbirth (PUBMED_ID=21831322) |
| 27                     | 4,209,953 BovineHD2700001041     | REPRODUCTION: Conception rate (PUBMED_ID=31299913), Reproductive efficiency CSMD1, LOC782601 (PUBMED_ID=26286463)   |
| <b>WWD<sup>#</sup></b> | 4 112,844,573 BovineHD0400032781 | HEALTH: Tick resistance (PUBMED_ID=28619006); MEAT AND CARCASS: Carcass weight ZBED6CL, LOC112446454, ZNF775, LOC511617, (PUBMED_ID=22479267), Fat thickness at the 12 (PUBMED_ID=22479267), Marbling score LRRC61, GIMAP8, GIMAP7, RARRES2, REPIN1 (PUBMED_ID=22479267); PRODUCTION: Average daily feed inta (PUBMED_ID=22479267), Average daily gain (PUBMED_ID=22479267), Body weight (yearling) (PUBMED_ID=30290764), Residual feed intake (PUBMED_ID=22479267)   |
|                        | 6 112,448,301 BovineHD0600033358 | MILK: Milk kappa-casein perce (PUBMED_ID=27485317) LOC112447132, LOC112447222   |
|                        | 7 20,673,981 BovineHD0700006039  | CONFORMATION: Udder depth (PUBMED_ID=21831322); HEALTH: Somatic cell score CELF5, TRNAM-CAU_5, LOC112447372, AES, (PUBMED_ID=21831322); MEAT AND CARCASS: Lean meat yield (PUBMED_ID=25273628); TLE2, S1PR4, TLE6, NCLN, GNA15, GNA11 PRODUCTION: Length of productive li (PUBMED_ID=21831322), Net merit (PUBMED_ID=21831322); REPRODUCTION: Age at first calving (PUBMED_ID=25178291), Calving ease (maternal) (PUBMED_ID=21831322), Daughter pregnancy rate (PUBMED_ID=21831322), Stillbirth (maternal) (PUBMED_ID=21831322)   |

|                        |            |                        |  |  |
|------------------------|------------|------------------------|--|--|
| 11                     | 98,929,180 | BovineHD1100028767     |  | SWI5, LOC107132969, TRNAR-UCU_5, LOC112448949, TRNAW-CCA_18, LOC112448915, GOLGA2, MIR199B, MIR3604-2, MIR3154, COQ4, MIR219-1, CERCAM, DNMI, TRUB2, SLC27A4, URM1   |
| 12                     | 59,106,604 | BovineHD1200016310     | MILK: Milk riboflavin content (PUBMED_ID=25771056)   |  |
| 13                     | 3,792,105  | BovineHD4100009863     | REPRODUCTION: Conception rate (PUBMED_ID=31299913)   | LOC112449424, SLX4IP, MKKS   |
| 15                     | 68,479,023 | BTB-00612553           | CONFORMATION: Rump angle (PUBMED_ID=21831322); HEALTH: Serotonin level (PUBMED_ID=32292413); PRODUCTION: Maturity rate (PUBMED_ID=26445451)  |  |
| 17                     | 65,618,037 | BovineHD1700019693     | REPRODUCTION: Conception rate (PUBMED_ID=28814769), Non-return rate (PUBMED_ID=29178833)   | LOC112442055, MYO18B   |
| 19                     | 62,556,282 | BovineHD1900018249     | MEAT AND CARCASS: Lean meat yield (PUBMED_ID=25273628); MILK: Milk fat yield (PUBMED_ID=21831322), Milk protein yield (PUBMED_ID=21831322, 22449276), Milk yield (PUBMED_ID=21831322); PRODUCTION: Body weight (yearling) (PUBMED_ID=24906442); REPRODUCTION: Non-return rate (PUBMED_ID=24265800)   | CEP112, APOH   |
| 24                     | 45,599,385 | BovineHD2400012691     | HEALTH: Abomasum displacement (PUBMED_ID=23548285)   | LOC101903660, EPG5, MIR6523A, MIR6523B, SIGLEC15   |
| 25                     | 30,331,706 | Hapmap27064-BTC-028223 | MILK: Milk protein yield (PUBMED_ID=22449276), Milking speed (PUBMED_ID=29705414)  | AUTS2  |
| 26                     | 26,877,456 | BovineHD2600007223     | MILK: Milk C14 index (PUBMED_ID=25511820, 26364108, 30243637, 31563305), Milk C16 index (PUBMED_ID=31563305), Milk fat yield (PUBMED_ID=31139206), Milk myristoleic acid c (PUBMED_ID=25511820, 26364108, 31563305), Milk palmitoleic acid c (PUBMED_ID=31563305), Milk protein percentage (PUBMED_ID=22449276); REPRODUCTION: Inseminations per conce (PUBMED_ID=20477799)              |  |
| 28                     | 26,661,955 | ARS-BFGL-NGS-1594      | REPRODUCTION: First service conceptio (PUBMED_ID=32650431), Inseminations per conce (PUBMED_ID=32650431)   | PALD1, LRRC20, EIF4EBP2, NODAL   |
| 29                     | 42,093,690 | BovineHD2900012868     | CONFORMATION: Conformation score (PUBMED_ID=27136002); MEAT AND CARCASS: Tenderness C29H11orf95, score (PUBMED_ID=29163638); MILK: Milk protein percentage (PUBMED_ID=20630249); ATL3, SPINDOC PRODUCTION: Average daily gain (PUBMED_ID=27136002), Growth index (PUBMED_ID=27136002); REPRODUCTION: Gestation length (PUBMED_ID=29178833), Interval to first estru (PUBMED_ID=29178833) | LOC112444891, PLA2G16, RTN3,   |
| <b>WWM<sup>h</sup></b> | 1          | 147,542,196            | BovineHD0100043239   | MILK: Colostrum albumin conce (PUBMED_ID=33255903) LOC112448047  |
|                        | 2          | 133,487,750            | BovineHD0200039106   | MILK: Milk fat yield (PUBMED_ID=22449276), Milk zinc content (PUBMED_ID=25989905) LOC112443641, LOC788425, AKR7L, EMC1, MRTO4, UBR4  |
|                        | 5          | 109,676,735            | BovineHD0500031776   | CONFORMATION: Conformation score (PUBMED_ID=24341352); MILK: Milk fat percentage (PUBMED_ID=27287773), Milk protein yield (PUBMED_ID=31139206); PRODUCTION: Maturity rate (PUBMED_ID=26445451) LOC101905166, H1F0, GALR3, MIR658, EIF3L, C5H22orf23, TRIOBP, GCAT, ANKRD54, MICALL1, POLR2F, SOX10 |
|                        | 8          | 105,641,396            | BovineHD0800032157   | ASTN2, PAPP  |

|                       |    |             |                       |  |
|-----------------------|----|-------------|-----------------------|--|
|                       | 13 | 78,533,511  | BovineHD1300022916    | MILK: Milk protein percentage (PUBMED_ID=22497459), Milk urea nitrogen yiel LOC101907588, LOC101907513, RIPOR3, PTPN1 (PUBMED_ID=22497459)   |
|                       | 18 | 20,659,854  | BTA-42769-no-rs       | PRODUCTION: Dry matter intake (PUBMED_ID=23031337)   |
|                       | 20 | 60,637,163  | BovineHD2000017040    | MEAT AND CARCASS: Muscle sodium content (PUBMED_ID=29163638); REPRODUCTION: First service conceptio (PUBMED_ID=32650431), Inseminations per conce (PUBMED_ID=32650431)   |
| <b>YW<sup>i</sup></b> | 1  | 157,605,027 | BovineHD1100023814    | LOC107131289, PRDM9, ZNF596  |
|                       | 2  | 94,636,270  | Hapmap50979-BTA-48487 | MEAT AND CARCASS: Muscle creatine content (PUBMED_ID=29163638); MILK: Milk kappa-casein LOC112442953, ZDBF2, GPR1, ADAM23 perce (PUBMED_ID=27485317), Milk protein percentage (PUBMED_ID=25148050); PRODUCTION: Body weight (birth) (PUBMED_ID=19966163), Body weight gain (PUBMED_ID=19966163), Dry matter intake (PUBMED_ID=23851991), Metabolic body weight (PUBMED_ID=23851991)  |
|                       | 3  | 101,605,832 | BovineHD0300029255    | MILK: Milk kappa-casein perce (PUBMED_ID=27485317), Milk unglycosylated kap RNF220, ERI3 (PUBMED_ID=27485317)  |
|                       | 4  | 111,112,243 | BovineHD0400032138    | MEAT AND CARCASS: Yield grade (PUBMED_ID=22394233); MILK: Milk protein percentage CNTNAP2 (PUBMED_ID=27506634); PRODUCTION: Body weight (yearling) (PUBMED_ID=19966163)  |
|                       | 6  | 86,762,457  | BovineHD0600024201    | CONFORMATION: Angularity (PUBMED_ID=29115939), Feet and leg conformati SLC4A4 (PUBMED_ID=21831322), Foot angle (PUBMED_ID=21831322), Rear leg placement - si (PUBMED_ID=21831322), Teat placement - front (PUBMED_ID=21831322), Udder attachment (PUBMED_ID=21831322), Udder depth (PUBMED_ID=21831322); HEALTH: Bovine tuberculosis sus (PUBMED_ID=26960806), Clinical mastitis (PUBMED_ID=23647142, 27760518), Ketosis (PUBMED_ID=31311492), Somatic cell count (PUBMED_ID=27534682, 21831322, 31139206); MILK: Cheese fat recovery (PUBMED_ID=27889122), Milk alpha-S2-casein pe (PUBMED_ID=27485317), Milk fat yield (PUBMED_ID=31139206), Milk glycosylated kappa (PUBMED_ID=27485317), Milk kappa-casein perce (PUBMED_ID=27485317), Milk phosphorylated alp (PUBMED_ID=27485317), Milk protein percentage (PUBMED_ID=20630249, 22449276, 27287773, 31139206), Milk protein yield (PUBMED_ID=27760518, 28358110, 29751743, 29921979, 30696404, 31139206), Milk rennet coagulation (PUBMED_ID=26947304), Milk unglycosylated kap (PUBMED_ID=27485317), Milk yield (PUBMED_ID=25084281, 25151887, 31139206), Time to curd firmness (PUBMED_ID=26947304); PRODUCTION: Lactation persistency (PUBMED_ID=27889128), Length of productive li (PUBMED_ID=21831322, 27889128), Net merit (PUBMED_ID=21831322); REPRODUCTION: Calving ease (PUBMED_ID=21831322), Calving ease (maternal) (PUBMED_ID=21831322), Conception rate (PUBMED_ID=31139206), Daughter pregnancy rate (PUBMED_ID=27209127, 31139206), Interval to first estru (PUBMED_ID=20477799, 28814769), Stillbirth (maternal) (PUBMED_ID=21831322) |
|                       | 7  | 105,857,552 | BTB-00115134          | MILK: Milk protein yield (PUBMED_ID=22449276), Milk tridecylic acid co (PUBMED_ID=27506634)  |
|                       | 8  | 84,579,963  | BovineHD0800025526    | MEAT AND CARCASS: Carcass weight (PUBMED_ID=22607022); MILK: Milking speed LOC112447923, CARD19, WNK2, NINJ1 (PUBMED_ID=29705414)  |
|                       | 9  | 68,870,505  | BovineHD0900019298    | SMLR1, EPB41L2   |
|                       | 12 | 19,910,693  | BovineHD1200006022    | HEALTH: Bovine tuberculosis sus (PUBMED_ID=30763354); MEAT AND CARCASS: Lean meat yield LOC112449043 (PUBMED_ID=25273628)  |

|                |            |                    |   |  |
|----------------|------------|--------------------|---|--|
| 15             | 65,148,971 | BovineHD1500018910 | MILK: Milk C14 index (PUBMED_ID=31563305), Milk capric acid conten (PUBMED_ID=30841852, ELF5, EHF 31563305), Milk fat percentage (PUBMED_ID=31139206), Milk fat yield (PUBMED_ID=29751743, 30696404, 31139206), Milk lauric acid conten (PUBMED_ID=31563305); PRODUCTION: Body weight (yearling) (PUBMED_ID=30290764)   |  |
| 16             | 76,408,519 | ARS-BFGL-NGS-30589 | CONFORMATION: Dairy form (PUBMED_ID=21831322), Teat length (PUBMED_ID=21831322); LOC112441872, DENND1B, MIR2284N, CRB1<br>HEALTH: Somatic cell score (PUBMED_ID=21831322); MEAT AND CARCASS: Marbling score (PUBMED_ID=29163638), Tenderness score (PUBMED_ID=29163638); PRODUCTION: Length of productive li (PUBMED_ID=21831322); REPRODUCTION: Daughter pregnancy rate (PUBMED_ID=21831322) |  |
| 18             | 7,691,780  | BTA-44411-no-rs    |   | LOC101902820, LOC112442253, LOC112442481, PKD1L2, CMC2, CENPN, C18H16orf46, GCSH, ATMIN  |
| 20             | 26,706,016 | BovineHD2000007953 | PRODUCTION: Body weight (yearling) (PUBMED_ID=19966163), Length of productive li (PUBMED_ID=27889128)   |  |
| 22             | 49,836,856 | ARS-BFGL-NGS-15965 | CONFORMATION: Hoof and leg disorders (PUBMED_ID=27344389); HEALTH: Ketosis (PUBMED_ID=31311492)   | LOC104975568, HEMK1, C22H3orf18, CACNA2D2, MAPKAPK3, CISH  |
| 29             | 46,700,354 | ARS-BFGL-NGS-18176 |   | LOC112444901   |
| <b>Simbrah</b> | <b>BW</b>  | 3 95,913,981       | BovineHD0300027678  | LOC112446108, FAF1, DMRTA2   |
|                |            | 5 109,058,472      | ARS-BFGL-NGS-63306  | CONFORMATION: Foot angle (PUBMED_ID=18565942)  |
|                |            | 13 80,054,531      | BovineHD1300023400  | MILK: Milk glycerophosphochol (PUBMED_ID=25670729)   |
|                |            | 19 21,849,452      | BovineHD1900006407  | REPRODUCTION: Conception rate (PUBMED_ID=31299913), First service conceptio (PUBMED_ID=31299913)   |
|                |            | 21 62,121,957      | BovineHD2100018719  | MILK: Milk conjugated linolei (PUBMED_ID=24909189); REPRODUCTION: Calving ease (PUBMED_ID=29178833)  |
|                |            | 24 61,732,249      | BovineHD2400018109  | CONFORMATION: Feet and leg conformati (PUBMED_ID=21831322), Foot angle (PUBMED_ID=21831322), Rear leg placement - re (PUBMED_ID=21831322), Rear leg placement - si (PUBMED_ID=21831322), Rump angle (PUBMED_ID=21831322), Stature (PUBMED_ID=21831322), Strength (PUBMED_ID=21831322), Teat length (PUBMED_ID=21831322), Udder depth (PUBMED_ID=21831322); HEALTH: Somatic cell score (PUBMED_ID=21831322); MILK: Milk fat percentage (PUBMED_ID=21831322), Milk fat yield (PUBMED_ID=21831322), Milk potassium content (PUBMED_ID=25989905), Milk protein percentage (PUBMED_ID=21831322), Milk protein yield (PUBMED_ID=21831322), Milk yield (PUBMED_ID=21831322); PRODUCTION: Length of productive li (PUBMED_ID=21831322), Maturity rate (PUBMED_ID=26445451), Net merit (PUBMED_ID=21831322); REPRODUCTION: Calving ease (PUBMED_ID=21831322), Calving ease (maternal) (PUBMED_ID=21831322), Stillbirth (PUBMED_ID=21831322) |

|                     |    |             |                    |  |
|---------------------|----|-------------|--------------------|--|
| <b>WWD</b>          | 2  | 126,959,242 | ARS-BFGL-NGS-75279 | CONFORMATION: Rump angle (PUBMED_ID=31633203); MILK: Milk fat yield LOC112443410, LOC112443411, LOC107131877, (PUBMED_ID=31139206), Milk lactose content (PUBMED_ID=29246110), Milk tetracosanoic acid CATSPER4, CEP85, CNKSR1, ZNF593, FAM110D, (PUBMED_ID=27506634), Milk zinc content (PUBMED_ID=25989905); REPRODUCTION: Conception PDIK1L, TRIM63, SLC30A2, EXTL1 rate (PUBMED_ID=31299913)   |
|                     | 3  | 79,022,233  | BovineHD0300022871 | MILK: Milk yield (PUBMED_ID=22449276) LOC101902048, PDE4B  |
|                     | 5  | 47,920,992  | BovineHD0500013910 | CONFORMATION: Stature (PUBMED_ID=21212230, 29459679), Teat thickness HMGA2, MIR763 (PUBMED_ID=28727049), Udder cleft (PUBMED_ID=28727049); PRODUCTION: Body weight (birth) (PUBMED_ID=24906442); REPRODUCTION: Gestation length (PUBMED_ID=22034999), Inhibin level (PUBMED_ID=23785023), Interval to first estru (PUBMED_ID=22100599), Pregnancy rate (PUBMED_ID=26020876)  |
|                     | 11 | 155,522     | BovineHD1100000016 | LOC112448861   |
|                     | 16 | 73,010,856  | BovineHD1600021426 | PRODUCTION: Body weight (weaning) (PUBMED_ID=25158260), Lactation persistency LOC112441917, LOC112441868, HHAT, SERTAD4 (PUBMED_ID=20412936)   |
|                     | 20 | 35,259,879  | BovineHD2000010095 | HEALTH: Abomasum displacement (PUBMED_ID=23548285), Respiratory rate (PUBMED_ID=26198991); FYB1 MEAT AND CARCASS: Lean meat yield (PUBMED_ID=25273628); MILK: Milk fat content (PUBMED_ID=30459810), Milk fat percentage (PUBMED_ID=20630249, 31139206), Milk fat yield (PUBMED_ID=22449276, 30459810), Milk protein percentage (PUBMED_ID=20630249, 21048968, 22449276, 27287773, 28377602, 31139206), Milk protein yield (PUBMED_ID=22449276), Milk yield (PUBMED_ID=31139206); REPRODUCTION: Calving to conception i (PUBMED_ID=28259397), Inseminations per conce (PUBMED_ID=28259397) |
|                     | 21 | 66,284,836  | BovineHD2100019902 | HEALTH: Immunoglobulin G level (PUBMED_ID=30241501) LOC112443172   |
|                     | 22 | 33,432,901  | BovineHD2200009669 | HEALTH: Somatic cell score (PUBMED_ID=25288516) FAM19A1  |
| <b>WWM</b>          | 6  | 112,861,438 | BovineHD0600033525 | REPRODUCTION: Retained placenta (PUBMED_ID=31931710) QDPR, CLRN2   |
|                     | 24 | 59,990,135  | BovineHD2400017485 | PRODUCTION: Body weight (yearling) (PUBMED_ID=19966163), Maturity rate LOC112444177, LOC101902622, CDH20 (PUBMED_ID=26445451)  |
| <b>YW</b>           | 14 | 25,259,499  | BovineHD4100011361 | HEALTH: Insulin-like growth fac (PUBMED_ID=22811567); MEAT AND CARCASS: Carcass weight TRNAC-GCA_175, TOX (PUBMED_ID=24116007, 25164077, 26104396, 27221246); MILK: Milking speed (PUBMED_ID=29705414); PRODUCTION: Body weight (birth) (PUBMED_ID=30290764); REPRODUCTION: Age at puberty (PUBMED_ID=22100599), Interval to first estru (PUBMED_ID=22100599), Scrotal circumference (PUBMED_ID=22811567)  |
|                     | 19 | 3,880,877   | BovineHD1900000960 | HEALTH: Bovine tuberculosis sus (PUBMED_ID=30763354)   |
|                     | 24 | 53,702,809  | BovineHD2400015420 | MBD2, LOC104975792, LOC112441476, STARD6, POLI, C24H18orf54  |
| <b>Simmental BW</b> | 16 | 73,216,135  | BovineHD1600021470 | MEAT AND CARCASS: Muscle phosphorus conte (PUBMED_ID=29163638), Muscle potassium conten (PUBMED_ID=29163638)   |
|                     | 16 | 73,216,135  | BovineHD1600021470 | SYT14  |

|            |            |                    |   |  |  |
|------------|------------|--------------------|---|--|--|
| 18         | 60,918,681 | ARS-BFGL-NGS-11218 | CONFORMATION: Foot angle (PUBMED_ID=21831322), Rear leg placement - si (PUBMED_ID=21831322), Strength (PUBMED_ID=21831322); HEALTH: Bovine tuberculosis sus (PUBMED_ID=26960806), Somatic cell score (PUBMED_ID=21831322); MILK: Milk fat percentage (PUBMED_ID=21831322), Milk fat yield (PUBMED_ID=21831322), Milk protein percentage (PUBMED_ID=21831322), Milk protein yield (PUBMED_ID=21831322), Milk tridecylic acid co (PUBMED_ID=27506634); PRODUCTION: Body depth (PUBMED_ID=21831322), Length of productive li (PUBMED_ID=27889128), Net merit (PUBMED_ID=21831322); REPRODUCTION: Calving ease (PUBMED_ID=21831322, 28109604), Conception rate (PUBMED_ID=28814769), Interval from first to (PUBMED_ID=28814769), Stayability (PUBMED_ID=29471369), Stillbirth (PUBMED_ID=21831322, 28109604) |  |  |
| 18         | 60,918,681 | ARS-BFGL-NGS-11218 |   | LOC532048, LOC504704, LOC615600, LOC515600, LOC506868, MGC139164, MIR371, MGC157082, NLRP12  |  |
| 25         | 19,912,086 | BovineHD2500005568 | HEALTH: Anti-Müllerian hormone (PUBMED_ID=29729909); MILK: Average daily milk yield (PUBMED_ID=28857209), Milk tridecylic acid co (PUBMED_ID=27506634)  | LOC112444373, SDR42E2, LOC112444300, TRNALUAG_3, TRNAL-AAG_9, VWA3A, POLR3E, EEF2K, CDR2   |  |
| 28         | 42,051,760 | BovineHD2800011945 | MEAT AND CARCASS: Shear force (PUBMED_ID=28727016)  | LOC112444747, LOC112444750, LOC112444720, LOC101907562, ANXA8L1, ANTXRL  |  |
| 29         | 41,063,582 | BovineHD2900012617 | MEAT AND CARCASS: Tenderness score (PUBMED_ID=29163638); MILK: 305-day milk yield (PUBMED_ID=ISU0100), Milk fat percentage (PUBMED_ID=20630249), Milk protein percentage (PUBMED_ID=20630249, 27485317, 32998688), Milk yield (PUBMED_ID=20630249); REPRODUCTION: Interval to first estru (PUBMED_ID=29178833)  | LOC112444961, LBHD1, LOC112444859, LOC112444936, LOC104976274, LOC112444959, LOC112444957, LOC112444955, LOC112444950, LOC112444960, LOC112444952, LOC112444953, LOC112444954, LOC112444948, C29H11orf98, ZBTB3, UQCC3, HNRNPUL2, TTC9C, B3GAT3, GANAB, INTS5, CSKMT, UBXN1, LRRN4CL, BSCL2, GNG3, POLR2G, TAF6L, TMEM179B, TMEM223, NXF1, STX5, WDR74, SLC3A2 |  |
| <b>WWD</b> | 1          | 155,461,258        | ARS-BFGL-NGS-39036  | MILK: Milk fat yield (PUBMED_ID=22449276), Milk protein yield (PUBMED_ID=22449276)   | LOC112448269, LOC101908237, LOC112448155, SATB1  |
|            | 9          | 60,827,498         | BTB-00397480  | MILK: Milk alpha-S2-casein pe (PUBMED_ID=27485317), Milk phosphorylated alp (PUBMED_ID=27485317); REPRODUCTION: Inseminations per conce (PUBMED_ID=24428918)   | LOC101903075, LOC100847428, LOC112448207, ANKRD6, MIR2903, GABRR1, RRAGD, UBE2J1, GABRR2 |
|            | 10         | 76,421,733         | BovineHD1000021867  | MILK: Milk glycosylated kappa (PUBMED_ID=27485317); PRODUCTION: Body weight (yearling) (PUBMED_ID=19966163), Body weight gain (PUBMED_ID=19966163); REPRODUCTION: Conception rate (PUBMED_ID=31718557), Inseminations per conce (PUBMED_ID=31718557)   | LOC112448595, LOC100297513, SYNE2, ESR2  |
|            | 27         | 39,714,460         | BovineHD2700011482  | MILK: Milk fat percentage (PUBMED_ID=29284405)   |  |

|            |    |             |                    |   |   |
|------------|----|-------------|--------------------|---|---|
| <b>WWM</b> | 3  | 99,860,543  | BovineHD0300028809 | MILK: Milk kappa-casein perce (PUBMED_ID=27485317), Milk unglycosylated kap (PUBMED_ID=27485317)  | LOC104971814, LOC101902049, LOC112446064, NSUN4, UQCRH, LRRC41, LURAP1, POMGNT1, PIK3R3, RAD54L, TSPAN1             |
|            | 4  | 114,805,260 | BovineHD0400033491 | HEALTH: Somatic cell score (PUBMED_ID=25288516); MEAT AND CARCASS: Carcass weight (PUBMED_ID=30290764); PRODUCTION: Average daily gain (PUBMED_ID=24730749), Body weight gain (PUBMED_ID=19966163)  | CCT8L2, KMT2C   |
|            | 11 | 65,476,648  | BovineHD1100018479 | MILK: Milk fat percentage (PUBMED_ID=25511820)  | LOC100139826  |
|            | 12 | 84,848,183  | BTB-00508549       | CONFORMATION: Feet and leg conformati (PUBMED_ID=21831322), Foot angle (PUBMED_ID=21831322), Rear leg placement - re (PUBMED_ID=21831322), Stature (PUBMED_ID=21831322), Strength (PUBMED_ID=21831322), Udder attachment (PUBMED_ID=21831322), Udder cleft (PUBMED_ID=21831322), Udder depth (PUBMED_ID=21831322), Udder height (PUBMED_ID=21831322); PRODUCTION: Body depth (PUBMED_ID=21831322), PTA type (PUBMED_ID=21831322), Rump width (PUBMED_ID=21831322)   | COL4A1  |
|            | 14 | 23,550,648  | BovineHD1400007309 | CONFORMATION: Stature (PUBMED_ID=21212230); HEALTH: Insulin-like growth fac (PUBMED_ID=22811567, 23785023); MEAT AND CARCASS: Carcass weight (PUBMED_ID=22497335, 22607022, 27112906), Fat thickness at the 12 (PUBMED_ID=22497335), Longissimus muscle area (PUBMED_ID=22497335), Marbling score (PUBMED_ID=22497335); PRODUCTION: Average daily gain (PUBMED_ID=22497335), Body weight (PUBMED_ID=26641032), Body weight (birth) (PUBMED_ID=19966163), Body weight (weaning) (PUBMED_ID=19966163), Body weight (yearling) (PUBMED_ID=19966163), Body weight gain (PUBMED_ID=19966163), Hip height (PUBMED_ID=31179577), Metabolic body weight (PUBMED_ID=28521758, 31931702), Residual feed intake (PUBMED_ID=22497335), Withers height (PUBMED_ID=31179577); REPRODUCTION: Age at puberty (PUBMED_ID=22100599, 26641032, 30997484), Calving ease (PUBMED_ID=24906442), Interval to first estru (PUBMED_ID=22100599, 26641032), Scrotal circumference (PUBMED_ID=22811567), Sexual precocity (PUBMED_ID=30053002) | SDR16C6, PENK   |
|            | 15 | 31,588,113  | BovineHD1500008710 | PRODUCTION: Body weight (yearling) (PUBMED_ID=19966163)   | LOC785951, GRIK4, TBCEL   |
|            | 23 | 17,791,358  | BovineHD2300004479 | MILK: Milk protein percentage (PUBMED_ID=31139206), Milk yield (PUBMED_ID=28358110, 29921979); PRODUCTION: Body weight gain (PUBMED_ID=19966163), Dry matter intake (PUBMED_ID=24183684)  | LOC101905117, MYMX, LOC101905365, SPATS1, TCTE1, CAPN11, HSP90AB1, TMEM151B, SLC29A1, SLC35B2, NFKBIE, AARS2, CDC5L |
|            | 27 | 11,205,123  | BovineHD2700003046 | PRODUCTION: Average daily gain (PUBMED_ID=22497295), Lactation persistency (PUBMED_ID=20412936)   |   |
|            | 29 | 7,859,363   | BovineHD2900002232 | REPRODUCTION: Conception rate (PUBMED_ID=31718557), Inseminations per conce (PUBMED_ID=31718557)  | LOC112444877  |



|    |    |             |                    |  |  |
|----|----|-------------|--------------------|--|--|
| YW | 5  | 113,010,737 | BovineHD0500032783 | CONFORMATION: Dairy form (PUBMED_ID=21831322), Feet and leg conformati (PUBMED_ID=21831322), Foot angle (PUBMED_ID=21831322), Rear leg placement - re (PUBMED_ID=21831322), Rear leg placement - si (PUBMED_ID=21831322), Strength (PUBMED_ID=21831322), Teat length (PUBMED_ID=21831322); HEALTH: Somatic cell score (PUBMED_ID=21831322); MILK: Milk fat percentage (PUBMED_ID=21831322), Milk fat yield (PUBMED_ID=21831322), Milk protein percentage (PUBMED_ID=21831322), Milk protein yield (PUBMED_ID=21831322); PRODUCTION: Length of productive li (PUBMED_ID=21831322), Net merit (PUBMED_ID=21831322); REPRODUCTION: Calving ease (PUBMED_ID=21831322), Calving ease (maternal) (PUBMED_ID=21831322), Daughter pregnancy rate (PUBMED_ID=21831322), Inseminations per conce (PUBMED_ID=32271764), Interval to first estru (PUBMED_ID=22100599), Stillbirth (PUBMED_ID=21831322) | LOC535121, LOC785804, MGC127055, CYP2D14, MIR2442, CENPM, 37865, WBP2NL, NAGA, PHETA2, SMDT1, NDUFA6, TCF20  |
|    | 10 | 77,297,598  | BovineHD1000022170 |  | LOC112448644, MAX  |
|    | 11 | 104,173,821 | BovineHD1100030298 | MILK: 305-day milk yield (PUBMED_ID=ISU0100), Cheese protein recovery (PUBMED_ID=27889122), Milk beta-lactoglobulin (PUBMED_ID=27485317, 29571285), Milk butyric acid conte (PUBMED_ID=29391528), Milk kappa-casein perce (PUBMED_ID=27485317)   | LOC101902839, LOC101902895, LOC107132967, LOC112448923, LOC112448928, LOC100848307, LOC112448857, LOC112448956, LOC112448907, LOC112448908, LOC112448904, LOC112448903, LOC112448905, EGFL7, FAM69B, LOC789606, LOC100139115, SURF2, MIR126, SURF4, AGPAT2, ABO, SURF6, MED22, RPL7A |
|    | 13 | 49,369,652  | BovineHD1300014404 | MILK: Milk protein percentage (PUBMED_ID=31139206), Milk yield (PUBMED_ID=22449276)  | LOC112449233   |
|    | 25 | 40,152,700  | BovineHD2500011470 | PRODUCTION: Dry matter intake (PUBMED_ID=24183684)   | SDK1, MIR2390  |
|    | 27 | 26,428,979  | BovineHD2700007194 | HEALTH: Bovine tuberculosis sus (PUBMED_ID=31480266)   | LOC101906081, LOC112441503, LOC112444672, DCTN6, RBPMS   |
|    | 28 | 33,608,386  | BovineHD2800009066 | MILK: Time to curd firmness (PUBMED_ID=26947304)   | DLG5, POLR3A   |

<sup>a</sup> Chromosome; <sup>b</sup> Position; <sup>c</sup> single nucleotide polymorphism; <sup>d</sup> QTLs found in the NAGRP CattleQTLdb database (Available online: <https://www.animalgenome.org/cgi-bin/QTLdb/BT/index>); <sup>e</sup> genes found in the assembly ARS-