youngstock in a given period is slightly better correlated with coat type at the end of the period than with coat type at the beginning of a period. Differences between breed groups do not exist. Partial correlation of coat type and youngstock weight do not differ significantly from zero.

VI. — Séance ouverte et boîte aux suggestions. II

MAXIMAL UTILIZATION OF HETEROSIS IN MILK AND BEEF PRODUCTION

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Authors worked out a breeding scheme in order to utilize the yearly genetic progress in milk and beef production as well as "hybrid vigor" and "type heterosis". Latter term is proposed to be introduced into the terminology of animal production. This scheme which integrates milk and beef production, keeps space with the international genetic progress and attains a heterosis effect over 60 per cent in milk production and at the same time assures a heterosis effect (hybrid vigor as well as type heterosis) of 100 per cent in the single suckler cow stock as well as in the population for direct fattening. In this scheme pure breeding is practiced only in herds meant for producing sires of high genetic quality whereas in milk and beef production only crossbred populations are involved. The scheme is already in practice within a large scale experiment of 6 000 cows in criss-cross breeding by using the best genetic material of *USA-Canadian* and *Danish Jersey* breeds and of three types of beef breeds. In this conception breeds are no more the objects of production but the building bricks of the production systems.

HITCH-HIKING EFFECT AND LINKAGE DISEQUILIBRIUM : THE EXAMPLE OF TWO CLOSELY LINKED LOCI IN THE PIG, *HALOTHANE SENSITIVITY* (*HAL*) AND *PHOSPHOHEXOSE ISOMERASE* (*PHI*)

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The gene for halothane sensitivity (*Hal^s*) is favoured in the selection for muscle development which has occurred in some modern breeds of pig (*e.g. Pietrain*). Such a selection tends to increase the frequency of another gene (*PHI^B*) at the closely linked locus for *PHI*, by virtue of a so-called "hitch-hiking effect", the *PHI* locus itself being selectively neutral. Another effect of selection at the *Hal* locus is to generate a linkage disequilibrium between the two loci, *Hal* and *PHI*, the evolution of this disequilibrium depending on the type of selection applied at the *Hal* locus. This point is demonstrated by the observation of two lines of pigs selected differently for 4 generations, and thus confirms a recent theoretical work (THOMSON, 1977) showing that a possible source of linkage disequilibrium may be the hitch-hiking effect of a selected locus on another closely linked neutral locus.

GRENZEN DER MAST- UND SCHLACHTLEISTUNG BEIM SCHWEIN UND SELEKTION ENTLANG VON LEISTUNGSGRENZEN

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Anhand von integral leistungsgeprüften Herden werden Papierselektionen durchgeführt. Die daraus resultierenden Merkmalsmuster zeigen, dass Niveaugrenzen auftreten können, welche das Zusammenwirken der Teilleistungen in ungünstiger Weise verändern. In einer Arbeitshypothese wird gezeigt, wie die Merkmalsmuster von Tieren, deren Leistungen Niveaugrenzen

überschritten haben, näher untersucht werden könnten. Hilfsparameter, die die Konstitution charakterisieren, sollten bei Basiszuchten herangezogen werden können, um eine Verknüpfung zwischen physiologischer Voraussetzung und eigentlicher Leistung zu finden. Resultierende Modelle könnten dazu dienen, das Leistungsmuster zu beurteilen auch wenn keine Angaben für einen metabolischen Index vorhanden sind.

ESTIMATION OF THE IMPROVEMENT LAG IN VERTICAL STRUCTURE OF HERDS IN HYBRIDIZATION PROGRAMME IN PIG BREEDING

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Equations for the estimation of genetic response achieved during one reproduction period in a three-tier system of herds were derived to determine the improvement lag between multiplier and elite herds and between commercial and multiplier herds used for the hybridization programme in pig breeding. The mean values of a production trait in individual categories of herds with regard to these improvement lags and reproduction periods are tabulated.

SELECTION INDEX FOR DESIRED GAINS

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Derivation of a selection index (I) to estimate the breeding value of an individual for various traits can be realised by definition of an aggregate genotype (H) in which traits are weighted by (relative) economic weights. Sometimes detection of unique economic weights is impossible. In those cases inspection of expected correlated responses in those traits to index selection may help to decide for a certain set of economic weights. Ultimately, one may wish to dercive a selection index not given economic weights but given desired responses to selection. Solutions to this problem are given and it has been pointed out that, assuming that the number of variates in I is larger than the number of traits in H, an infinite set of index solutions exists : all giving the desired responses to selection in the traits in H. Only one solution among these, however, results in maximum desired responses.

MODELS FOR REALISED AND PREDICTED HERITABILITIES

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The on-farm management practices which may bias phenotypic covariances as estimators of genetic parameters in a commercial pig population are discussed. A procedure is developed which should correct point estimates for environmental bias in a non-random mating population.

REDUCING SAMPLING ERRORS IN CONSTRUCTING GENETIC SELECTION INDICES

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A method of modification (bending) of estimates of parameters in constructing selection indices is proposed. The method consists of reducing the spread of the roots of the determinantal equation $|\widehat{G} - \lambda\widehat{P}| = 0$, or, equivalently, the roots of $\widehat{P}^{-1}\,\widehat{G}$. Monte-Carlo simulation indicated that the procedure is effective in improving the achieved response. Methods of choosing the bending factor in practice are considered.