

ENERGETIC AND WORK QUALITY
INVESTIGATION OF MAIZE STALK CHAFFING
WITH ALONG-STALK DIGESTING

A. SERRANO, J. BENSE - 1982

Investigación Agrícola, Universidad de Chile

The investigation about the energetic and work quality of maize stalk chaffing with along-stalk digesting is presented in this paper. The results of the energetic and work quality of the chaffing process are presented. The energetic and work quality of the chaffing process are presented. The energetic and work quality of the chaffing process are presented.

PART I.

ABSTRACT OF SELECTED PAPERS

BEST RESULTS IN THE PRODUCTION OF THE
EXPERIMENTAL PLOTS

The results of the experimental plots are presented. The results of the experimental plots are presented. The results of the experimental plots are presented.

ANALYSIS OF MAIZE STALKS
AND A STUDY OF THE ECONOMIC
COSTS

The analysis of maize stalks and the economic costs are presented. The analysis of maize stalks and the economic costs are presented. The analysis of maize stalks and the economic costs are presented.

HOW TO COLLECT AND EVALUATE RESEARCH
DATA BY MEANS OF A
COMPUTER

The collection and evaluation of research data by means of a computer are presented. The collection and evaluation of research data by means of a computer are presented. The collection and evaluation of research data by means of a computer are presented.

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ENERGETIC AND WORK QUALITY INVESTIGATION OF MAIZE STALK CHAFFING WITH ALONG-STALK DIGESTING

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In the Hungarian climate the silage maize plays an outstanding role as mass fodder. The harvest of the silage maize is a technically well elaborated task and the same time the loss consequent upon fermentation, storage and feeding partly can be still due to the imperfectness of the chaffing.

Among most known digesting and compactibility improvement methods are the crushing simultaneously with the chaffing or immediately following that. The technical solutions use crushing cage, roller pairs type corn crackers. They significantly reduce the mass rate of the self-propelled chaffers. The energy need increase has several reasons.

The most important are as follows:

- When installing a crusher cage the chaffing drum overtakes the role of a hammer mill which operates in very low efficiency level, due to its structural realisation.
- The corn cracker roller pair uses the principle of roller mill, but all the material flow goes through it (not only the grains) so that the energy consumption is extreme compared to the expected aim.
- Any type of crushing device built after the drum is an obstacle to the material flow which makes necessary to use a high energy demanding chaff reaccelerating unit.

Because of the disadvantages obvious to the operating people, many farmer ignore the crushing units. As for the manufacturer, they sell those units as orderable options although they manufacture them pushed by the competitors.

In the followings those investigations to develop equipments which can be built in self-propelled chaffers and apply to crushing treatment of green fodder's before chaffing are reported.

ANALYSING CLEANING PARAMETERS OF MILKING DEVICES

(Quality factors affecting milk production and milking with different type milking devices an OTKA - Hungarian Basic Research Fund - project)

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When considering the quality of milking and the produced milk, technical parameters of milking devices are classified in two groups:

- a) Parameters affecting milking efficiency and the health of the cow herds.
- b) Parameters determining milk quality

The clean-ability of the pipelines is of fundamental importance. The well cleaned machine will neither contaminate the milk nor infect the cow udder.

The efficiency of pipeline cleaning is significantly improved by introducing air in the ducts and such way the cleaning time and the amount of cleaning liquid are reduced. If the intake air is mixed in the cleaning liquid there will be a higher velocity, intensively eddying flow in the tubes implying highly effective cleaning onto the tube walls.

The size increase of short and long milk ducts and collectors stabilises the milking vacuum. From the point of view of cleaning

the controlled air intake is more advantageous. By the control, optimal conditions are reached even in quite varying circumstances, as for the cleaning liquid velocity and turbulence.

In the case of larger milking devices (with longer and greater diameter pipelines) the combined injector cleaning is proposed.

In this method one can adjust the following parameters as desired:

- volume of liquid
- chemical concentration
- cleaning duration

There is no doubt, that the technique exposes environmental benefits through the adjust-ability of these factors, also. (The waste amount and its storage cost and the environmental load is reduced, etc.)

TEST RESULTS OF THE PRODUCTION OF THE EXPANDED MIXED FODDER

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At the fodder mixing plant No.1. of the Bábolna Fodder Industry Ltd a KAHL OE 30.2 type expander with a capacity of 24t/h has been running since March, 1995. By running this expander the HTST (High Temperature Short Time) technology is the very first one in use in Hungary. In the technology line the expander unit is between the mixer and the press equipment.

The investor has been initiated wide range of examinations in terms of utilization of the expanded mixed fodder. In the scope of the examinations the Hungarian Institute of Agricultural Engineering was entrusted to test the influencing technological factors of the physical-mechanical features of the pellet made by this process.

WEAK-POINTS OF MACHINE CONSTRUCTIONS AND A POSSIBLE METHOD FOR RECOGNISING THEM

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In an earlier paper of us [1] a short survey was given on the process of failure analysis and its applicable methods. The weak-point terminology was discussed and the serviceability analysis steps in the weak-point recognition was only touched. In the present article discusses some aspects of the construction, the weak-point recognition and the maintenance and the computer assistance possibilities for weak-point recognition.

HOW TO COLLECT AND EVALUATE MEASURED DATA BY MATHEMATICA?

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The fact that a human being does not like to make routine tasks led to the quick development of computer science. The collection, registration and evaluation of large number of measured data are the day-to-day work of engineers, agronomists, biologists, etc. Their work cannot dispense with the computers.

Although most of the programs are able to do statistics to some extent it may be interesting how to process data with a software of symbolic mathematical operations, with *Mathematica*. The article presents some examples for normal distribution, interpolation, regression, and analysis of fitting.

TEST RESULTS OF 150-200 KW POWER OUTPUT HEAVY UNIVERSAL TRACTORS

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For the Hungarian agricultural production the modernisation of the tillage aim high performance power machine stock has a great importance. That should not mean only the replacement of the existing power machine fleet with new machines but technical development, too. The aim of the production efficiency and economy imply new and greater requirements to the power machines of the basic tillage, as well. Taking those requirements also into consideration one has to establish new system of higher requisites such as proper performance, economy, low specific consumption, environment friendly engine, powershift transmission gear the attachability of the existing implements of RÁBA 250 tractors, favourable energetic operation, electrohydraulic control of lifting equipment.

TWO-DIMENSIONAL FINITE ELEMENT ANALYSIS OF SOIL CUTTING BY MEDIUM SUBSOILER

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Two-dimensional finite element model was developed by which the work done by medium subsoiler was simulated. Loosening of sandy soil was investigated not only by the shank and chisel of the subsoiler separately, but also with both together. The soil was considered as nonlinear elastic-perfectly plastic material. By the constructed model, the loosening of layered agricultural soils can be assessed (e. g. loosening of a hard pan that generally results from repeatedly applying of mouldboard plow or disc harrow at same cultivating depth).

EXAMINATION OF WORK ORGANISATION QUESTIONS OF THE SHEEP HUSBANDRY

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In the last years the high rate decreasing in the stock has stopped and a moderate expansion is forecasted. The reasons are the improving market position of the meat and milk products and so the possibilities getting more income.

The debates about the utilisation directions can be considered as finished - due to the results of the scientific research. The overwhelming part of the professionals agree on the economical reasonableness of the specialisation. The market need promotes the meat, milk and the double utilisation directions. In the double utilisation both meat and milk can be the first utilisation aim.

The chosen technology and its frame, the **rational operation organisation** is an outstandingly important factor for the successful realisation of the utilisation direction.

The organisation of the work - according to the general (and accepted) terminology - is such an aimful, planned and continuous control activity which supports the efficient utilisation of the available sources and production factors (assets, workforce, biology resources) for the given tasks. The forming of the organisation is influenced by technology features, division of labour, the type of working phases and operations, the largeness of the branch, and so on.

The examination of the applied technology and the work organisation can produce much information to judge the efficiency and earning capacity of the production.

SIMULATION POSSIBILITIES OF CLIMATE CONDITIONS IN GREENHOUSES

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The tested model describes the processes taking place in greenhouses most completely. This model is suitable for the simulation of climate conditions of mulch and greenhouses with different structure and type (mulch, row cover, plastic tunnel, simple and double covered greenhouses, glasshouse) with different type of covering materials (glass and plastic film). The processes can be defined in the course of simulation at any time, at any time interval, at any climate conditions, and at any geographical place.

There are a lot of elements and details elaborated -not yet too exactly- in relation to vital processes by plants, to thermal and light conditions, to the connection between outside environment, radiation, and the greenhouse. For example, it can be a problem to use the correct value for giving the average temperature and the amplitude for temperature outside (initial values). This model is destined to estimate the daily development of climate elements at any time in a year, at any day as exactly as possible.

It can be determined by our and others' research in this field, that the condition of covering material is not negligible in the radiation and light conditions in greenhouses. This factor is left out of consideration by the known models. That is why the models have to be formed more correct in the determination of the connection between the covering material conditions (ageing and condensation) and the inside climate ones. Now the researches and experiments are directed to find out the adaptation of the worked out programs, and they show in the direction of the exact revelation of connection between the light- and radiation transmissivity and condition of covering materials.

MEASURING ODOUR EMISSION OF POULTRY HOUSES, THE EXPERIENCES OF THE MEASUREMENTS

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The professionals began to deal with the environment pollution odour effect of the animal husbandry at the beginning of the 1960 years. In the animal houses and barns as well as in the animal farms the increase of the animal stock caused an increase in the liquid and litter manure quantity and the amount of smelly materials, too. Almost everybody has his/her own experience with smell emission of the large scale plants. The inhabitants of the nearby villages know especially well the features of the animal farms located too close to the habited areas without considering the typical wind direction and the features of the ground.

ANALYSIS OF GRINDING'S BASIC ENERGETIC RELATIONSHIP (OTKA T 016124)

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- 1) The specific superficial grinding energy consumption e_s (kWh/cm²) is a positive linear function of the specific grinding energy requirement e_g (kWh/t), if the specific surface increase of grit Δ_{ag} (cm²/g) remains constant.
- 2) The specific grinding energy demand e_g (kWh/t) is also a positive linear function of the specific surface area increase Δ_{ag} (cm²/g), if the specific superficial grinding energy consumption e_s (kWh/cm²) equals constant. The larger the specific surface area increase Δ_{ag} (cm²/g) (i.e. the grit fineness) is, the bigger specific grinding energy requirement e_g (kWh/t) amounts and reversely.
- 3) The specific superficial grinding energy consumption e_s (kWh/cm²) is a first grade hyperbolic function of the specific surface area increase Δ_{ag} (cm²/g), when the specific grinding energy demand e_g (kWh/t) is kept constant.
- 4) Its inverse function $e_s(e_g)$: specific grinding energy requirement (kWh/t) – specific grinding energy consumption (kWh/cm²) also makes a first grade hyperbolic function, if e_g (kWh/t) = constant.
- 5) From the two specific energy demands e_s (kWh/cm²) the specific superficial energy consumption seems to be an independent variable, – as a physical property of the ground material (in case of us, feed grain). If e_s value is low (i.e. the material is easily to be broken), – the grind will be fine, if e_g (kWh/t) = constant. Oppositely, when e_s (kWh/cm²) is high, coarse grit should be expected.

AMMONIA EMISSIONS FROM COMPOSTING ANIMAL WASTES IN WINDROWS

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It can be concluded that the absorption principle NH₃ measurement is suitable method to determine the NH₃ emission directly. The measuring technique developed for clamp composting should be however with high emission (low C/N ratio) material composting. As the different compost making processes and the different material properties significantly influence the behaviour of the process, it is necessary to carry out of the above mentioned experiment. In the course of windrow composting the homogenisation and the complete hygienisation is ensured by the proper rotation rhythm. However, the continuous temperature control is essential. The quality of the samples examined so far meet the prescription of the „Bundesgütegemeinschaft Kompost“ conditions for commercial introduction. The fresh compost produced in the experiments is applicable to use for soil improvement and as fertiliser and the matured compost as black mould.

COMPUTER IMAGE PROCESSING POSSIBILITIES IN THE EVALUATION OF TILLAGE AND FERTILISER SPREADER MACHINES

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The computer image processing was accomplished based on the Machine II real time video digitiser card of FAST Electronic

GmbH (Germany, München). The card was installed in an IBM 386 DX personal computer and the general purpose image processing software DigiCell 4.0 version of ASK Ltd. (Hungary, Budapest) as well as a commercial JVC-GA/Ax55 VHS/C video camcorder with a CCD camera were also used. This minimal apparatus makes possible the evaluation of the video records in computer. The modular DigiCell program package run under Windows 3.1 (or higher) and uses pull-down and icon menus. The application is flexible enough and is applicable to measure the image characteristics and parameters of the single video pictures.

EXPERIMENTS CARRIED OUT WITH ACTIVE CUTTING ELEMENT TILLAGE TOOL

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Based on the previous research and development results the aim was to make such a tool, where the motion of the cutting plate of the traditional plough serves the favourable energy saving affect. Such way the breast does not move, so that no resistance increase should be considered. The vibration system is formed by springs giving motion in parallel and perpendicular directions to the plough edge. The system contains no external driving, so that the excitation depends mostly on the spring parameters (selfexcitation system).

RELATIONSHIP BETWEEN SCREEN SURFACE GEOMETRY OF HAMMER MILLS AND ENERGETIC PARAMETERS

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Changing the peripheral speed of the hammers, the mass performance of the hammer mill has a maximum value between 65 and 70 m/s. The energy consumption of the mill shows an optimum at around that velocity values. Of course, the fineness of the product will grow with the increasing of the speed. The relationships show that the 'expanded plate' screen is equivalent with screen $\phi 5$ mm in fineness production. (The specific surface area is calculated from the particle size distribution data, so $dA/dt = m\Delta a_f$) It is very clear from the diagram that the 'edges' of the screen holes play an important role in the comminution and the energetic properties of the 'expanded plate' and drilled screens are better. Moreover the active surface area of the screen 5 d2 is bigger than the conventional screen $\phi 5$ or 5 d1!

The constant lines as energy levels prove the same and it has to be remarked that the operation ranges do not cover each other at all.

EVALUATING THE TECHNICAL PRODUCTION CAPACITY OF AGRICULTURE

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In the course of the transformation of the agriculture great changes has come about the state of machine stock, ownership structure, machine usage practice and the operations, as well. The aim of the research to resurvey the changes of machine stock and production capacity and to examine the relations of production tasks and the machine capacities.

In the elaboration of the topic the present potential of the machines and implements have been examined and compared to the ten years ago stock and capacity figures. The nominal capacity of the complete stock is corrected by factors characterising the wearing out and technical state of machines, and so determining the real capacities in general and for each groups.

The investigations accomplished, and the evaluations produces the result, that the machine stock decreased by more than 6 % in the examination period resulting also a fall in the machine capacity. Even a greater capacity fall presented itself due to the machine ageing and wearing out. Whilst ten years ago the machines were able to produce 76 % of their nominal capacity, the relevant figure is only 60 % now. The average operation time of the implements was reduced from 940 to 670 working hours.

EXPERIENCES OF THE CONSERVATION CORN PRODUCTION AT 1995.

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In the past years some experiments have been carried out to establish the technological and technical bases of the Conservation Corn Production. In connection with this the existing technical solutions, machine modifications and developments were sought and the lacking machines were bought.

The technical aggregate was mainly established on our own resources adapted to the already existing home machine aggregates. On this basis, production technology experiments were carried out to judge the home applicability of corn production technologies.

The United States is considered as the base of the adaptation experiments, where four different corn production technologies are in usage, such as mulch, band, ridge and direct planting. Till the beginning of 1995 the nonploughing technology was used, like cheesel plow, subsoil loosener and heavy disk. Those experiments applied seeding in mulch and band planting technologies. The examinations are included in the previous years reports of us.

The other two nonploughing corn production technologies which has not been examined in detail so far are the direct planting and the ridge ones. The investigations started in this year (1995).

The aim of this was to modify the Planter of type KÜHNE-CASE-IH-Cyclo-800 to applicable to use for direct planting and ridge planting. Using such type of set-up production technology experiments was accomplished in direct planting and in starting the technology preparation for ridge cultivation with building up ridges. So that our this year investigations focused on the direct planting technology.

Another goal of the 1995 year investigations was to carry out further technology experiments with the nonploughing corn production technologies in order to practical set-up and yield registration. The Tillage equipments had been: CONSER TILL-4,2 cheesel plow and KÜHNE-CASE-IH-10-770 heavy disks in 1995 for the nonploughing corn production technology experiments.

ELEKTROSTATIC SPRAYING RESEARCH AT APPLE PLANTATIONS

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Nowadays, the uses of chemical saving, environment friendly and plant protecting methods are spreading wide in the intensive

fruit-gardens. In Hungary, we have tested the application of the MARTIGNANI kwh electrostatic drop-filling spray machine at some apple-plantations.

In summary, we found the above-mentioned machine applicable in traditional fruit-gardens. Beside the optimum research conditions, the according to figure savings and advantages mentioned by the manufacturer can be probably reached, but there are needs for further testing.

TECHNOLOGICAL DEVELOPMENT FOR IMPROVING THE QUALITY OF FLUE-CURED TOBACCO

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Our institution has been working on the examination of the basic characteristics of flue-cured tobacco for five years. The main elements of this research work are the following: measurement of thermal features, the monitoring of colour-changes and the examination of some of the physical parameters. At present we only measure the levels of the most important chemical components (carbohydrate, total nitrogen, reducing sugar, nicotine).

The measurement of some of the chemical components has shown that there is a close relationship between the quality categories and the chemical characteristics of flue-cured tobacco. The amount of reducing sugar and total nitrogen varies considerably, depending on the curing schedule. The nicotine content does not change significantly. This means, that we are not able to influence the nicotine content by using this curing technology. Another result is clear, that the quality alters at different ripening levels.

In Hungary it is very important to improve the quality of flue-cured tobacco. The author hopes that the new (advanced) applied curing schedule can contribute to this.

SOME EXPERIENCE WITH MEASURING THE SMELL EMISSION OF PIG HOUSES

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As it is well known the animal husbandry houses indicates their presence by odour. As the animal husbandry is unavoidable due to their role in the food production, the people accept the activity; in the most family houses of the villages and towns people keep some kind of animal. The properly kept few pigs and few tens of poultries can be well tolerated and is an everydayness phenomenon. The greatest repulsion to the animal keeping is generated by the smelly odour independently on that the objector person grows animal or not. The problem arises when the large scale farm model is used in small animal houses, because the necessary conditions of the transferred technology do not exist. The lacking conditions may be the lack of the manure deposition technicalness, of the afforestation made according to the human and animal hygiene aspects which defends against noise and smell and of the protective distance meeting the home regulations. The animal husbandry plants pollutes the environment in several ways and among the others by their odour from the smelly materials produced in operation.

In our department the odour effects of the animals of poultry and pig houses are also examined.

The research aim is to search relationships between the different animal husbandry technologies, keeping methods, the number of animals and the resulted odour for obtaining solution to reduce the odour emission.

