

Part III.

ABBREVIATED TEST REPORTS

APPROXIMATE TEST REPORTS

RENAULT 155-54 TZ tractor

Manufacturer: Renault Agriculture, France

The RENAULT 155-54 TZ tractor is a heavy, universal power machine with a semi-self-carrying chassis fitted with a auxiliary front-drive.

The tractor is operated by a six-cylinder, direct injection, turbo-load Diesel engine with max. 100.2 kW P.T.O. output. According to the traction results carried out on asphalt road 0.80-0.82 output utilization efficiency can be obtained in 4 gears. Hitching and field tests were made with 4 different implements.

Summarizing the results it can be stated that the RENAULT 155-54 TZ tractor can be grouped into the category of widely used heavy, universal tractors and it improves the narrow choice of smaller tractors of this class.

Main technical data:

Engine output	100.2 kW
No. of gears	16 forward 16 reverse
Speed range	2,15-31,42 km/h
Hydraulic system pressure	.192 bar
lifting capacity	42 kN
Linkage mechanism	ISO III



KBP-11,5 trailer

Manufacturer: Agrinnov Ltd. Nyíregyháza, Hungary

The KBP-11,5 two-axled trailer was designed for IFA-L60 lorry. First of all, it is suitable for transport of bulk materials. The operational safety of the machine is acceptable.

Under average operative conditions the transport capacity in river gravel transportation during the basic time was 5,7 t/h, in the case of 93 km transport distance.

Main technical data:

Load capacity	11,5 t
Own weight	4,25 t
Load platform	12,87 m ²
Wheel size	12.00-20ST
Brake system	pneumatic
Load capacity	14.35 m ³



CSEPEL D-566 lorry

Manufacturer: Csepel Autógyár – MH, Hungary

The modified 7 ton load capacity, all-wheel drive Csepel D-566 lorry with a 3-way tip box is suitable for transportation of various bulk materials. The engine and power transmission system make the operation possible under unfavourable conditions too, when a six ton nominal load capacity trailer is coupled to the lorry. Its good cross-country capacity and the mounted additional speed-proportional drive possibilities also make the lorry suitable for operation of special farm devices.

Main technical data:

Load capacity	7.0 t
Own mass	9,4 t
Load volume	4,45 m ³
Engine output	147 kW
Max. speed	80 km/h
Wheel size	14.00-20

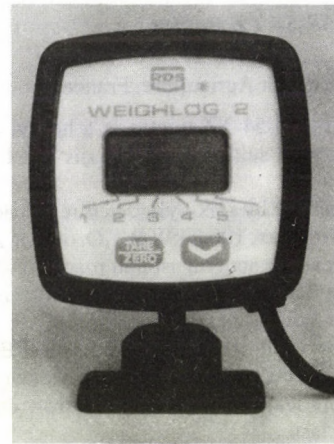
FARMER-06 trailer

Manufacturer: Gépipari Vállalat, Szentes, Hungary

The Farmer-06 two-axled trailer can be operated with tractors. First of all, it is suitable for transport of bulk materials. The operational safety of the machine is acceptable. Under operative conditions the transport capacity in maize silage during the basic time was 5,6 t/h.

Main technical data:

Load capacity	6 t
Own weight	2,3 t
Load platform	9,68 m ²
Load volume	9,68 m ³
Wheel size	12,5-18 (10PR)
Brake system	pneumatic



SZE rotary ploughing tiller

Manufacturer: AGRIKON RT, Kecskemét, Hungary

During the tests it was stated, that the soil-driven star-wheels form an even soil surface and improve the breaking-loosening work of the plough by 35-80%, depending on the working speed. The energy demand of the tiller consisting of six rotors was only slightly higher as of the sole plough and did not essentially affect the energetic harmony of the tractor – plough. Its operational safety is good ($K_4=0.97$). The tiller mounted on the RIH-10-720-6/18-KMT plough, pulled by RÁBA-Steiger tractor can perform 1,2 ha/h. The equipment can be well-utilized with a plough for one pass tilling on different types of soils.

Main technical data:

Working width	2,75m
Working depth	max.12 cm
No. of star wheels	6
Diameter of star-wheels	600 mm
Mass	300 kg

WEIGHLOG weight indicator

Manufacturer: RDS-H Kft., Gödöllő, Hungary

The Weighlog weight indicator is suitable for measuring of mass lifted by machines equipped with hydraulic lifting device. The five channels of the instrument can be calibrated for five crops, or machines. The sixth channel can be used for the adding of the values measured by the six five channels. The device – with keeping the operative recommendations – is able of mass measuring within 2% limit of error.

Main technical data:

Feed voltage	10-16 V/DC)
Current consumption	100 mA
No. of displays	6
Numerical display	4-digit
Dimensions	143x101x82 mm



ABG ammonia injector and embedder

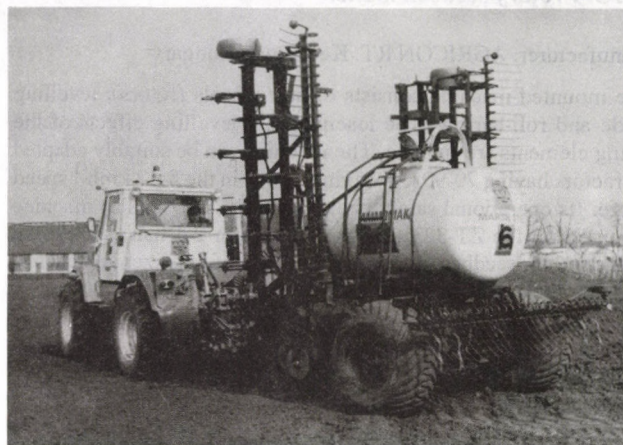
Manufacturer: AGRICON RT, Kecskemét, Hungary

The ABG ammonia embedder machine is suitable for the application of water-free ammonia in a depth of 8-12 cm. However, if the machine is equipped with twin-wheels and operated by RÁBA-250 tractor carrying Huniper-2000 sprayer it can be also used – together with ammonia injection – for application of suspension. The area treated by the machine can be expected between $W_{01}=6,4-6,8$ ha/h and $W_{03}=4,4-4,7$ ha/h.

Its quality of work meets the agrotechnical requirements. The loss (evaporation) of ammonia put into the soil is insignificant. The operational safety of the machine is acceptable yet ($K_4=0,91$).

Main technical data:

Volume of ammonia container	1,5 m ³
Application rate	100-250 kg/ha
Working width	8,4 m
Depth of work	8-12 cm
Tractor required	180 kW



HCS-9 clod crusher roll

Manufacturer: AGRICON RT, Kecskemét, Hungary

The test of the clod crusher roll according to the crushing-loosening and levelling effects of its elements are suitable, but better compaction can be only maintained by increasing the line-load. The pulling resistance of the rolling elements is insignificant therefore the machine can be well-adapted energetically to the tractors having 80-100kW engine output in the 6-10 kmh⁻¹ speed range. Its operational safety is suitable ($K_4=0,96$). In general, the crusher roll operated by the FIAT-1880 DT tractor can cultivate 5,0 hah⁻¹. It can be used for clod crushing and sealing of soil surface satisfactorily.

Main technical data:

Working width	9,7 m
No. of roll members	5
Width of roll members	1920 mm
No. of rolls/diameter	
Flat roll	5/520 mm
Ring roll	122/400 mm
Clod crusher	126/420 mm



MARSK STIG ammonia injector

Manufacturer: MARSK STIG A/S, Denmark

The Marsk Stig ammonia injector is suitable for early spring top dressing of autumn-sown plants, for N-supply of maize after seedbed preparation and for application of N-fertilizer, required after the autumn soil preparation, before sowing. The amount applied can be regulated steplessly between 80 and 200 kg/h. The area treated during the productive time is 5,9-6,32 ha/h. The quality of application is suitable. The loss (evaporation) of ammonia after the application into the soil is insignificant. The operational safety of the machine is suitable ($K_4=0,96$).

Main technical data:

Volume of ammonia container	2,03 m ³
Working width	7,5 m
Depth of work	8-15 cm
Tractor required	min. 150 kW



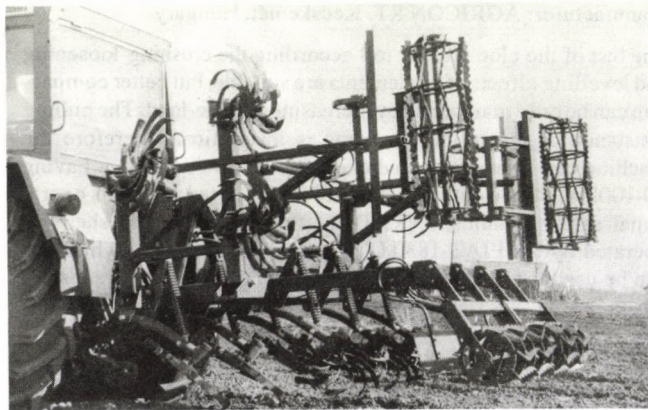
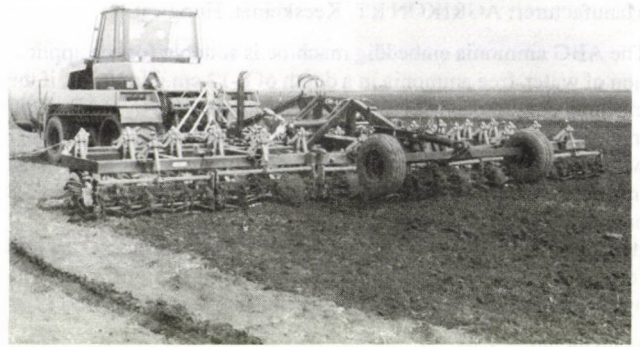
FMG-4 rotary seedbed maker

Manufacturer: AGRICON RT, Keckemét, Hungary

The mounted machine consists of star wheels (rotors), levelling blade and roll-harrow. The loosening and levelling effects of the tilling elements are suitable. The machine can be suitably adapted to tractors having 70-90 kW engine power in the 8-12 kmh⁻¹ speed range. Its operational safety is excellent (K₄=0,99). The machine mounted on the ZT-323 tractor can perform 2,4 hah⁻¹. It can be well-used for seedbed preparation, mixing of fertilizer and chemicals into the soil as well as for soil cultivation on different soils.

Main technical data:

Working width	4,0 m
Working depth	max.12 cm
no. of starwheels	12
Diameter of starwheels	630 mm
No. of roll-harrows	40



WN 12 seed dresser

Manufacturer: W. Niklas GmbH, Germany

The seed dresser have been made for wet dressing of grains, maize, peas and beans. The throughput of the machine is 3,42-11,66 t/h in wheat and 4,34-7,27 t/h in case of peas. During the work quality tests, the quantity of dressing material got onto the units of seeds varied between 3,06-4,21%, which is quite good. It operational safety is very good. (K₄=1,0). The seed dresser can be well fitted in the machine-lines of the different seed-plants. The machine met the requirements excellently.

Main technical data:

Nominal output in wheat	2-12 t/h
Dressing material feeding	0,5-20,0 cm ³ /kg
Post-mixer	brush type
Total electric power needed	2,01 kW

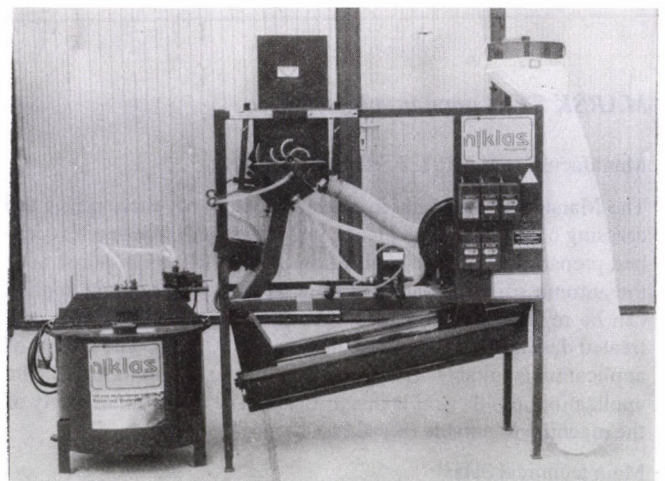
KRM-8,4M rotary seedbed maker

Manufacturer: AGRIKON RT, Kecskemét, Hungary

The machine, consisting of soil-driven star-wheels(rotors), levelling blade and roll-harrow, worked satisfactorily during the test. Even taking into consideration the heavier soil conditions the machine can be well-matched energetically to the 180-190 kW tractor in the 8-14 kmh⁻¹ speed range. Its operational safety is suitable (K₄=0,96). The machine operated by a RÁBA-Steiger tractor can perform 6,5 hah⁻¹ in average. It can be well-used for ploughed land planing, cultivating and seedbed making, on soils of various resistance..

Main technical data:

Working width	8,4 m
Working depth	12 cm
No. of tilling units	3
No. of starwheels	14+13
Diameter of starwheels	630 mm
No. of roll-harrow members	6



FLEXI-COIL-800/1110 drill-cultivator

Manufacturer: Flexi Coil Ltd., Canada

The machine – consisting of a field cultivator and a pneumatic drill – operated after different preceding crops and in various field preparation. During the test the cultivator has worked satisfactorily and favourable results were obtained in the application of fertilizer and seeds in the range of 8-12 km.h⁻¹. The machine can be well adapted to the tractors having 180-190 kW engine power. Its operational safety is good (K₄=0,98). The average area output with Rába-Steiger tractor is 5,4 ha.h⁻¹. On different soils the machine can be used for soil preparation and drilling operations of ploughless technology.

Main technical data:

Working width	8,2 m
No. of cultivator hoes	27
No. of coulters	27
Container volume	2,28+1,59 m ³
No. of spring harrow gangs	5



K-42 0 and K-430 balers

Manufacturer: Fortschritt Erntemaschinen GmbH, Germany

The balers with sliding piston can be used for baling of both hay and straw. Considering the whole working time the output of the machines were between 4,5 and 5,5 t/h. In the case of hay the bale density was between 171,9 and 162,2 kg/m³. The operational safety of the machines is suitable. The fuel consumption changed between 4,21 and 6,19 kg/h.

Main technical data:

	K-420	K430
Width of pick-up	1,6 m	1,8 m
Bale dimensions	360x400x1200 mm	
No. of tying heads	2	2
Tractor required	30 kW	40 kW

E-303 B self-propelled windrower

Manufacturer: Fortschritt Erntemaschinen GmbH, Germany

Widths of the cutting tables delivered together with the machine are: 5,6-4,2-3,6 m. The output of the windrower, equipped with conditioner, can be varied between 2,0-2,5 ha/h, related to the total working time. Utilization of the working width of the machine is 92-94% in the speed range of 8-13 km/h and the stubble height was between 83-93 mm. In the case of 6,5-6,9 kg windrow mass per metre the utilization of engine output varied between 50-70%. The operational safety of the machine is suitable.

Main technical data:

Engine output	44 kW
Working width	3,6-4,2-5,1-5,6 m
Cutting height	4,5-7,0-9,5-13 cm
Width of conditioner drum	1800 mm



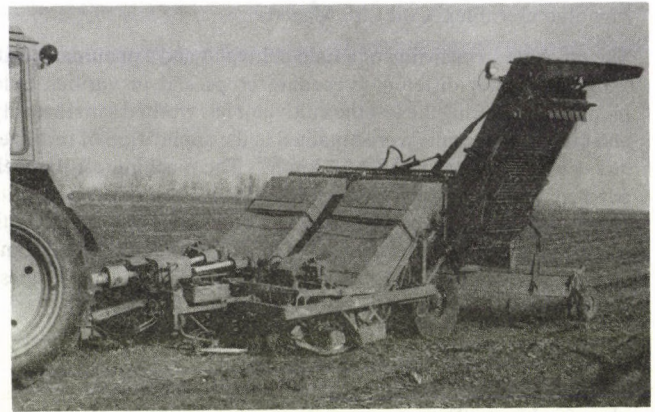
K-440 baler

Manufacturer: Fortschritt Erntemaschinen GmbH, Germany

The K-440 baler operated by a tractor having 37-44 kW engine output can be used safely for baling of grasses, lucerne and straw. During the total working time the obtainable output of the machine is 4-5t/h. Under Hungarian conditions the machine – first of all – can be taken into consideration in large-scale farms for supplying fodder or straw.

Main technical data:

Width of pick-up	1,78 m
Bale size	360x460x1200 mm
No. of tying heads	2
Tractor required	45 kW



KSZV-6V sugar beet lifter-loader

Manufacturer: Combine Factory, Ternopol, USSR

The 6-row harvester with 45 cm row distance has a working width of 2,7 m. The self-propelled machine lifts the sugar beet roots – topped previously and after cleaning loads into the transport vehicle in one pass. Its work can be characterized by 3,5% loss of harvest and the active root cleaning effect. The shift output is 6-7 ha while the season output is 120-150 ha. The self-propelled machine is operated by a 125 kW engine.

Main technical data.

Working width	2,7 m
No. of rows	6
Row distance	45 cm
Engine output	125 kW

BM-6B sugar beet topper-loader

Manufacturer: Combine Factory, Ternopol, USSR

The pull-type machine with 45 cm row distance and 2,7 m working width tops 6 rows of sugar beet in the soil and loads the leafy tops into the transport vehicle. The standard topping ratio is between 60-70% with 0,5% soil contamination is. The machine is able to top 6-7 ha/shift i.e. the tops of this area can be harvested. It requires min. 59 kW tractor power with a P.T.O. shaft with 540 r.p.m.

Main technical data.

Working width	2,7 m
No. of topable rows	6
Row distance	45 cm
Tractor required	min. 59 kW



Matrot M-31 Electronic sugar beet harvester

Manufacturer: Matrot S.A., France

The working width of the 6-row harvester is 2,7 m. In one pass the machine performs the following operations: topping, lifting, cleaning and loading. 60-70% standard topping and 2-3% harvesting loss characterize its work. The area harvested is 9-11 ha/shift, while the season output is over 300 ha. The self-propelled machine with hydrostatic power transmission is operated by a 175 kW engine.

Main technical data:

Working width	2,7 m
No. of rows	6
Row distance	45 cm
Engine output	175 kW



RG-188 spayer regulator

Manufacturer: RDS Technology Ltd., England

The RG-188 type sprayer regulator measures the working pressure and on the basis of this, it regulates. The regulator can be mounted additionally, on most sprayer machines. Before operation the instrument must be programmed and henceforth the regulator shows the most important parameters during the spraying operation. The measured and displayed values are: the working pressure, the momentary liquid output, the speed of travel, the daily and total area sprayed. On the basis of the tests it can be stated that connecting the units of the regulator and the programming of the central electronic unit should be done by specialist at the first mounting, while every further modification can be performed – with care – by non-qualified persons too. The measuring and controlling precision of the regulator as well as its operational safety are suitable.

Main technical data:

Feed voltage	12 V ^{+42%} _{-17%} DC
Current rate	3 A
No. of programmable parameters	9
No. of displayed values	5
Dimensions	320x155x93 mm



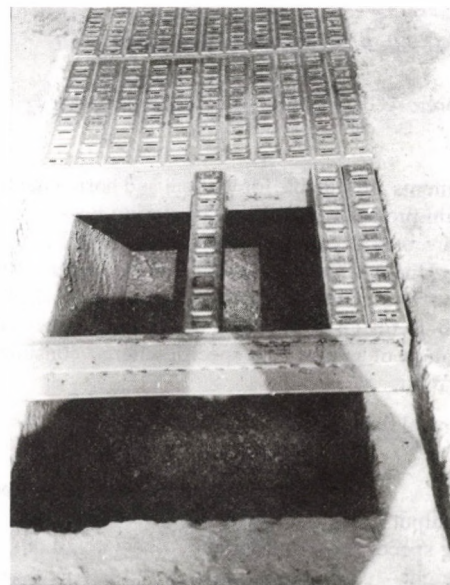
SZP ventilating floor

Manufacturer: AGRIKON, Kecskemét, Hungary

The SZP ventilating floor was made for airing of horizontal stores and flat-bottomed low tower stores. The equipment can be assembled from panels which are galvanized. With the SZP-1 and SZP-5 equipment, suitable to tower stores, 10 m³/h, t air change can be maintained if they cover 20% floor space. In the case of horizontal stores 25m³/h.t air-change can be performed with 20% built-in-area. The specific energy consumption is 0.01-0.02 kWh/t.

Main technical data:

Panel size	386x50x44 mm
Sheet thickness	from 1 mm to 2,5 mm
Gap surface ratio	6-8%
Panel mass	from 0,4 to 1,0 kg/pc



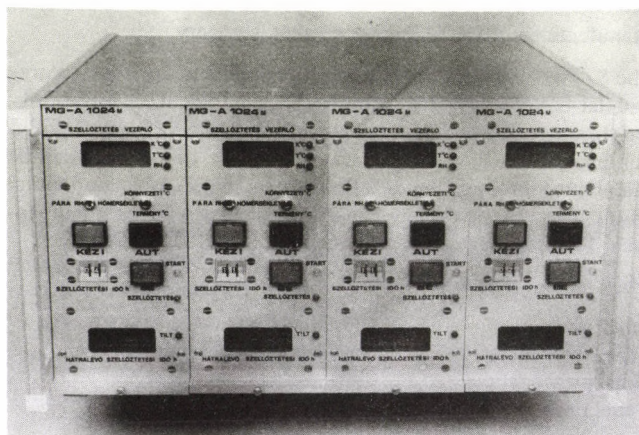
MG-A 1024 M ventilation controller

Manufacturer: FM, Műszaki Intézet, Gödöllő, Hungary

The MG-A 1024 M modul-type ventilation controller is suitable for ventilation control of the grain tower driers used for preservative ventilation. The device is flexibly adaptable to the size of the storage plant, thanks to its modul construction. Its repair can be easily and fast done with the change of a calibrated modul. On the basis of the experiences of laboratory and functional tests it measures the temperature of the environment and crop, the air humidity and also performs the control functions suitably. With the use of the controller about 4,000 kg of fuel and 3,000 kWh of electric energy can be saved by tower per year. The setting and handling of the device are simple, there is no need for special knowledge.

Main technical data:

Feed voltage	220 V 50 Hz ^{+10%} _{-15%}
Power input	70 VA
No. of parameters measured	5
Protection	IP 42
Dimensions	430x220x460 mm



BCS unloading planetary augers

Manufacturer: AGRIKON RT, Kecskemét, Hungary

The BCS planetary augers are suitable for unloading of grain storage towers having a diameter of 11-27 m and flat bottom. The measured unloading capacity of the augers are 67 t/h in case of BCS-50/11 and 85 t/h in the case of BCS-80/24 auger. The specific electric energy consumption was 0,06-0,11 kWh/t at the former one and 0,12-0,16 kWh/t was at the latter. Their quality of work and operational safety are acceptable and they meet the labour safety regulations.

Main technical data:

	BCS-50/11	BCS-80/24
Nominal output	50 t/h	80 t/h
Length	5,193 mm	11,600 mm
Diameter	178 mm	130-150 mm
Revolution	348 r.p.m.	292 r.p.m.
Built-in electric power	4 kW	11 kW

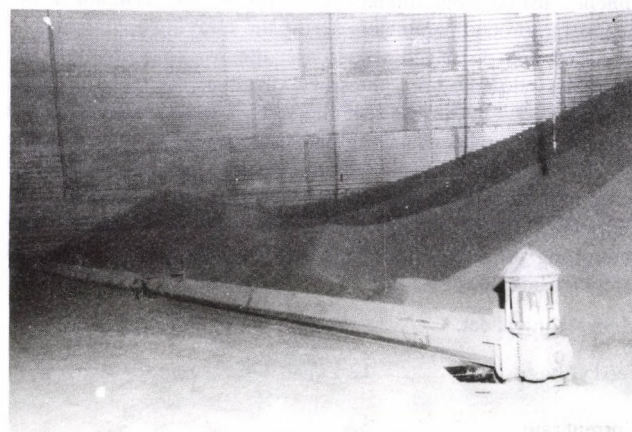
F-20 and R-20 material conveying equipment

Manufacturer: AGRIKON RT, Kecskemét, Hungary

The equipments are suitable for vertical and horizontal transportation of grain products (e.g. filling of storing tower). The vertical elements are bucket elevators and the horizontal ones are chain conveyers. Under laboratory conditions the output of the equipment can be 36 t/h, but in operating circumstances the output was between 10-14 t/h. Grain crushing was not experienced during the transportation of grains. The specific energy consumption was 0.06-0.1 kWh/t.

Main technical data:

	F-20 M bucket elevator	R-20 chain conveyer
Nominal output	25 t/h	20 t/h
Conveying speed	1,85 m/s	0,4 m/s
Built-in height	31 m	-
length	-	40 m
Electric power	4,0 kW	3,0 kW



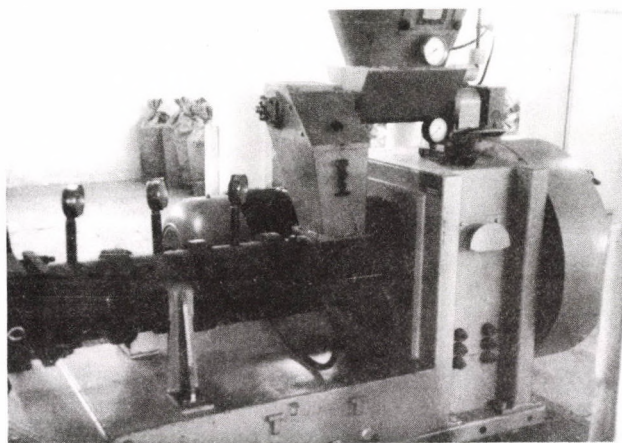
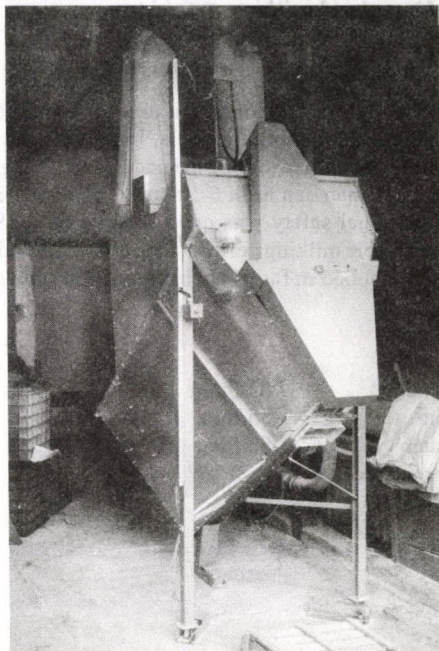
Piko-180 IV extruder

Manufacturer: Walter Maschinenbau GmbH, Germany

The Piko-180 IV extruder is suitable for mechanical and hydro-thermal processing of grain products. On the basis of the tests the Piko-180 IV machine showed higher output (1.0-1.2 t/h) than the nominal one, in the case of processing of pulses and other grain products. The specific energy consumptions – regarding the most important products – were 43,3 kWh/t for soya, 60.6 kWh/t for maize and 61,8 kWh/t for wheat. Besides this, the values (physical, toxicological) of quality of the processed materials also proved suitable on the basis of the tests. Concerning the output the energetic and quality work as well as the operational safety the Piko-180 IV extruder belongs to the well-suited category.

Main technical data:

Nominal output	0.8 t/h
Parameters of augers can be	built-in:
Length	75-218 mm
Thread pitch	62-86 mm
Revolution	960 r.p.m.
Built-in electric power	80 kW



SKIOLD COMPACT-500 feed mill and mixer

Manufacturer: SKIOLD Maskinfabrikken, Denmark

The SKIOLD COMPACT-500 milling and mixing equipment is suitable for mixed animal feeds production according to specified composition, using 4 different basic materials as well as concentrate or premix.

The precise feeding of the basic material sucked automatically is done by metering elements.

In the case of well-homogeneous feed production the output of the equipment is 260-400 kg/h, depending on the premix or concentrate. The specific energy consumption was between 6,88 and 9,92 kWh/t, according to the feeds.

Main technical data:

Nominal capacity	500 kg/h
No. of suction heads	3
Electric power requirement of the mill	4 kW
Volume of mixing container	1200 litres
Electric power requirement of the mixer	2,2 kW

SKIOLD FEEDTRONIC fodder mixing and pelleting plant

Manufacturer: SKIOLD Maskinfabrikken, Denmark

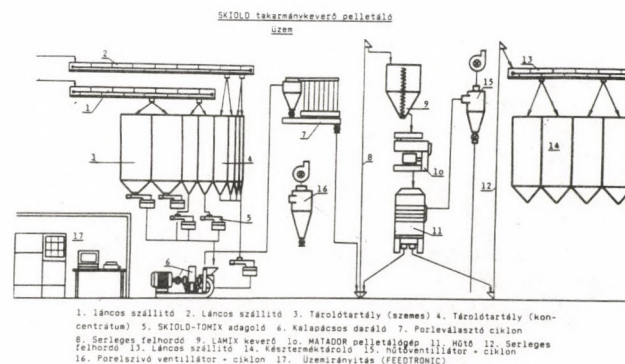
The SKIOLD fodder mixing plant is designed to produce pelleted mixed animal feeds, using different grain basic materials and concentrate, according to a prescribed composition, as well as to store the fodder temporary.

The technology based on the FEEDTRONIC system is a continuous, milling, pre-mixing and pelleting system with mass-oriented feed ing.

The plant can maintain 5-5,5 t/h output in continuous operation. The utilization of the operational time is 90-100%. The energy consumption of the plant is 21.5-24,2 kWh/t.

Main technical data:

The nominal output of the plant	5 t/h
Volume of pre-stores	136 m ³
Volume of after-stores	136 m ³
Overall dimensions	15x6x13 m
Built-in electric power	206 kW



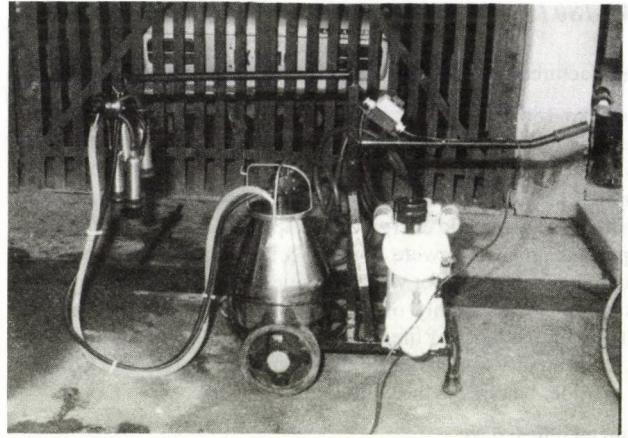
FARMER-1 household milking machine

Manufacturer: VAGÉP Nyíregyháza, Hungary

The vacuum pump of the milking device is able to deliver 85 litres of air per minute after 200 working hours, but reserve air is not available. The milking cup size joining the udder is large, regarding the tested animals. A man can milk 6-10 cows per hour with this machine. Its operational safety was quite suitable ($K_4=0.98$). In operation the expectable milking performance is 0.4-2,5 l/min. The milker can be well-applied in farms having one or two cows.

Main technical data:

Vacuum pump output	83 l/min
No. of pulsation	55/min
Operating vacuum	5 kPa
Electric power required	0.75 kW



CONTENTS

Part I.	
ABSTRACTS OF SELECTED PAPERS	5
Part II.	
SELECTED SCIENTIFIC PAPERS	11
Technical solutions for bacterium fertilization	
L. Halász and L. Mátyás	
Hungarian Institute of Agricultural Engineering, Gödöllő	13
The characteristic features and extent of losses in function of the system of sprayer and of facts of vegetation and environment	
Dr. Gy. Dimitrievits – J. Huszár – L. Pintér	
Hungarian Institute of Agricultural Engineering, Gödöllő	15
Field test of the Challenger-65 rubber-belt tracklayer tractor	
Dr. J.I. Jóri – G. Radványi – Dr. S. Soós – Dr. M. Sente	
Hungarian Institute of Agricultural Engineering, Gödöllő	17
Variation of the germination capacity, the yield and other plant characteristics in case of seed fractions graded by seed separator	
Dr. P. Soós – Dr. Zs. Szüle – Dr. E. U. Dul	
University of Agriculture, Gödöllő	19
Combined production technology of silo-maize and soya	
Dr. P. Szenrő – Dr. Zs. Szüle – Dr. J. Nagy – Dr. Gy. Baksay – Dr. Zs. Szentpétery	
University of Agriculture, Gödöllő	20
Calculation of motion-fitness of vehicles moving on the ground	
Dr. L. Laib	
University of Agriculture, Gödöllő	23
Feedrate monitor and forward speed control system	
Dr. A. Fekete – Dr. I. Földesi – L. Seres	
Hungarian Institute of Agricultural Engineering, Gödöllő	25
Automatic filling-station without operator	
Dr. J. Janik – Dr. O. Szijjártó	
University of Agriculture, Gödöllő	27
Effect of change of the farm structure on the mechanization	
Dr. J. Hajdu	
Hungarian Institute of Agricultural Engineering, Gödöllő	29
Possibilities of mechanization of agricultural production, organization and economy on the basis of model-studies	
I. Kiss	
University of Agriculture, Gödöllő; College of Agriculture at Nyíregyháza	31
The possibilities of a concerted development of custom-service and consulting referring to structural changing	
Dr. I. Husti – Dr. J. Kiss	
University of Agriculture, Gödöllő	33
Modification of suction-pressure pulsation ration	
Dr. L. Tóth – Dr. J. Bak	
Hungarian Institute of Agricultural Engineering, Gödöllő	36
Technical and energetic analysis of fodder treatment technologies	
Dr. J. Csermely – Dr. M. Herdovics – Gy. Komka	
Hungarian Institute of Agricultural Engineering, Gödöllő ...	39
Atomization and spray characteristics of air atomizing and cone nozzles	
Dr. Gy. Dimitrievics – J. Huszár – L. Pintér – J. Bangó	
Hungarian Institute of Agricultural Engineering, Gödöllő ...	40
Automated forcing of vegetables without soil	
A. Kovács – L. Dobos – Zs. Madarász – J. Fejes – P. Tóth	
University of Horticulture and Food Industry, Kecskemét ...	41
Air – and heat – engineering tests of Bábolna-type driers for cereals and determining development trends	
Dr. M. Neményi – Dr. K. Kacz – Z. Sárkány	
Pannon University of Agriculture, Mosonmagyaróvár	
Z. Békési	
Agricultural Company, Bábolna	42
Recent results offered by three-dimensional briquetting of agricultural by-products	
J. Nagy	
Hungarian Institute of Agricultural Engineering, Gödöllő	
K. Nyitrai – L. Szabó	
University of Technical Sciences, Budapest	44
Energetics analysis of crushing theories (rittinger, kick, bond)	
Dr. I. Bölöni – Dr. J. Csermely	
Hungarian Institute of Agricultural Engineering, Gödöllő ...	45
Testing the specific heat of Pioneer-type maize hybrids	
Dr. J. Beke	
University of Agriculture, Gödöllő	46
The application of moisture measurement at microwave frequency on grain-dryers	
Dr. P. Sembery	
University of Agriculture, Gödöllő	48
Applicability of infratelevision for detecting state of plant	
Mrs. Gy. Gilly	
University of Agriculture, Gödöllő	
Z. Papp	
Hungarian Institute of Agricultural Engineering, Gödöllő ...	49
Soil conservation tillage	
Dr. M. Birkás	
University of Agriculture, Gödöllő	
Dr. A. Szemők	
University Training Farm, Gödöllő	51
Laboratory robot with irrigation adapter	
Dr. Gy. Beer – Dr. O. Szijjártó	
University of Agriculture, Gödöllő	53
Part. III.	
ABBREVIATED TEST REPORTS	55

