Requirements of the 3-point-linkage as basis for an international standard.
H. Pfab
GERMANY 95

Compacting properties of grass material harvested for ensiling.
K. Skjervheim
NORGE 97

Analysis of possibilities of grain-chaff mixture separation in horizontal air stream in the process of cereal total harvesting.
A. Lisowki
POLAND 99

Variations in the feedrate of combine harvesters.
A. Fekete
HUNGARY 101

Utilization of combine performance on large-scale farms in Hungary.
I. Sóros
HUNGARY 103

Studies on threshing parameters of pigeon pea (cajanus cajan).
M.P. Singh, B. Singh
INDIA 104

A mechanical link system steering a two-wheel unbalanced farro trailer.
Hideo Terao,
JAPAN 105

The field performance of a new track system.
F.G.J. Tijink, W.B.M. Arts
THE NETHERLANDS 107

Application of alcohol fumigation to diesel tractor engine.
N. Terao, N. Nogushi
JAPAN 109

The natural gas and the refined biogas as agricultural traction fuels.
C. De Zanche, D. Friso
ITALY 111

Modelling fertilizer flow centrifugal spreader.
R. Adjroudi, M. Rousselet
FRANCE 112

Physical properties of fertilizer after handing to spreader.
G. Lundin
SWEDEN 114

Optimization criteria for linkages used in agricultural machines.
J. Uzio
POLAND 115

Field tractive performance comparisons between a tractor operated in the 2WD and 4WD mode.
C. Jenane
MOROCCO 117
L. Bashford
USA

Design, operation and performance of a gantry system for arable crops.
V.C.T. Chamen, P.R. Leede.
D.J. Longstaff, D. Dowler
UNITED KINGDOM 119

# Study of the influence of three soil work systems in winter cereal crops.
E. Gil, G. Gorches
SPAIN 122

A study on the estimation of appropriate tractorisation for the southern anatolia project (GAP) area in Turkey.
K.O. Sølr
UNITED KINGDOM
H.U. Eevin
TURKEY 124

Fracturing of soil chods and crumbling effectiveness of draught tillage implements.
R. Bernsen, B. Berre
NORWAY 126

Traction performance and effects on the turf of two types of tyre.
W.B. M. Arts, J. van Maanen,
B. R. Verweij
THE NETHERLANDS 127

Electronic governing of tractor engines.
N. Tarasiński, K. Skjervheim
NORGE 129

BUILDINGS

Structural design loads for bins and silos - an overview.
J. C. Jofriet, S. C. Negi
CANADA 130

Concrete grain silos. Structural problems, their causes and remedies.
L. Nilsson
SWEDEN 133

Monitoring and evaluation of grain storage systems.
E. H. Bartali
MOROCCO 135

Use of plaster board in farm buildings.
B. svensveld, P-O. Mattson
SWEDEN 137

Utilization of rice husk and brans as furnish for particleboard production in Nigeria.
S.A. Dada
NIGERIA 139

Subterranean concrete structures for storage in agriculture.
J. W. Freney
THE NETHERLANDS 140

Gas production of fattening pigs.
E. N. J. van Ouwerkerk
THE NETHERLANDS 141

A computer model for predicting ammonia release rates from under-floor swine manure pit.
D.L. Day, R. H. Zhang, K. Ishibashi,
W. P. Jepson
USA 142

Development of an aviary system for laying hens with low ammonia emission.
P. W. G. Koerkmad
THE NETHERLANDS 144

The influence of ventilation and manure handling on air pollution in swine confinement buildings.
C. Manera, P. Picano, S. Margiotta
ITALY 147

Development and testing of a particulate and viable aerosol removal system for livestock housing.
D. S. Bundy, S. J. Hoff
USA 149
Study of the Influence of Three Soil Work Systems in Winter Cereal Crops
(No. 9201 131)

Gorcs, G., Gil, E.
Department of Agricultural Production and Department of Agricultural Engineering respectively, Escola Superior d'Agricultura de Barcelona, Urgell, 187 Barcelona, Spain

Introduction

The particular conditions that involve agriculture in the last years (surpluses in many cultures, a constant increase of the production costs, low prices of many products, etc.) are the reasons why many farmers have had to change their yield objectives: now, the best way is not the more productive, but the cheaper production.

There are a few methods that allow to decrease the cost of production maintaining at the same time that production between acceptable values. One of this ways is related with tillage, which represents a very important portion of the total cost of the operations in the farm.

In this work, we have tried to determine the agronomic consequences involved with the different types of soil work in winter cereal crops.

Soil work types

First of all, we have had to choose which kind of soil work we should study. In the last years, many new concepts have emerged related to the soil work (minimum tillage, zero tillage, soil work reducing the number of passe, as well as some new tools (*chisel*, combined implements, etc.).

The main objectives of all this new concepts are: a) to reduce the cost of production; b) to reduce the problems related with the use of too intensive production systems (the idea is to decrease all problems related with environmental pollution by nitrates and pesticides, soil losses by erosion and to reduce the total consumption of water and energy).

So, although there exists a lot of different techniques of soil work, in practice, the farmer has only three different systems to use that have all necessary conditions to receive characteristic names. These three systems of soil work are that we have chosen for our present experience:

i.- Conventional tillage: mouldboard plough, cultivator and rotary harrow of vertical axis and roller. The average work depth is about 25 cm.
ii.- Minimum tillage: chisel and rotary harrow of vertical axis and roller. Average work depth: 12 cm.
iii.- No tillage or zero tillage: direct drill with double disc. In this case, the average work depth is about 6 cm on the line.

Vegetal material

We have realised an experience (dry conditions) of control and measurements of the first year cereal crop after four years legume crop without any soil work.

A cultivar of the following three winter cereal species has been used: wheat (Triticum aestivum L.), barley (Hordeum vulgare L.) and triticale (X Triticosecale wittmark).

Barley has been chosen by its special adaptation to our dry conditions. Wheat has been studied because of its adaptation too, and because the price is, in general, more interesting for farmers than barley's. We have used triticale in order to determine the potential yield in our conditions.

The election of the varieties of each species has been done by three different aspects: a) fitting between development cycle and climatic conditions; b) good knowledge from several previous works; c) the varieties must be representative in the experience area.

We have analyzed the influence of soil work on the production of each of the three species, and its factors: the idea has been to relate the production differences obtained with the crop cycle and the yield factors, as well as to emphasize the different response of each studied species.

Results

The soil work type has influence only during vegetative period (crop in direct drilling have emerged 6 days later). These differences have been analized in state 30 of decimal code of Zadoks scale.

Crop density (plants per square metre) has been significantly influenced by soil preparation techniques (i: 253; ii: 226; iii: 124), but we do not find such differences in the number of ears per square metre.

In relation to yield (5890 Kg/Ha average experience), the differences are not due to soil work type, but only to the species (triticale: 6475 Kg/Ha; barley: 5975 Kg/Ha; wheat: 5220 Kg/Ha).

It is important to remember that the type of soil as well as its structure, by precedent crop, did not present any limitations.

This work must be continued in the next years, in order to eliminate the influence of precedent culture (alfalfa during four years).