The Effect of Moisture Content on Physical Properties of Berberis

E. Velayati1* - B. Emadi2 - M. Khojastehpour3 - M.H. Saidirad4

Received: 15-5-2010
Accepted: 5-4-2011

Abstract

In order to enhance the mechanization level of harvest and post-harvest operations of Berberis fruit, as one of the major and local crops of south Khorasan province, some of its physical properties were investigated. Different dimensions, geometrical mean diameter, sphericity, surface area, mass of thousand fruit, true density, bulk density, porosity, static coefficient of friction and the repose angles were determined. The properties and the effect of moisture content on them were studied by the completely randomized designs statistical method. Analysis of data indicated that the change of moisture content caused significant difference (P<0.01) for the total studied parameters except static coefficient of friction on polyethylene and wood materials. Length, width, thickness, geometrical mean diameter, surface area, sphericity, mass of thousand fruit and bulk density decreased with the decrease in moisture content and true density, porosity, repose angles and static coefficient of friction on all studied materials except wood and polyethylene increased with decrease in moisture content.

Keywords: Physical properties, Berberis, Moisture content

1, 2, 3 - MSc Student and Assistant Professors, Department of Agriculture Machinery, Faculty of Agriculture, Ferdowsi University of Mashhad, Respectively
(*) - Corresponding Author Email: ehsanvelayat@yahoo.com
4 - Assistant Professor, Khorasan Agricultural and Natural Resources Research Center, Mashhad.
Investigation and Determination of Corn Combine Harvester Losses to Introduce Appropriate Methods to Reduce Losses

M.R. Mostofi Sarkari

Received: 26-5-2010
Accepted: 13-3-2011

Abstract

Corn harvesting involves some losses. These losses result in decreased benefits. It is almost impossible to lower losses to zero percent but it can be controlled in an acceptable level. As a result of this research, appropriate methods are introduced to decrease losses and reduce waste. In this project, losses in different part of combine were measured and evaluated according to the available standard method (ASAE S396.2 & S343.3). Harvesting losses include preharvest and during harvest losses comprising ear loss and kernal loss in the header, cylinder and cleaning losses. This project was conducted on farmers’ lands in Gazvin province. Some assessments related to yield factors were evaluated in different parts of farm with specified area, e.g. Plant height, ear number, stem diameter, ear diameter, cob diameter, row/ear and seed/row. All losses evaluated in three treatments which they were: seed moisture content (w.b.) in three levels of 19%, 23% and 27%, ground speed in three levels of 0.8, 1.2 and 1.6 ms\(^{-1}\) and cylinder speed of 400, 600 and 800 rpm. The split plot experimental design based on the randomised complete block design (RCBD) was used to evaluate treatments. Measured losses compared with standard values to introduce the proper methods to decrease losses and proper adjustments. The results show that appropriate seed moisture content, cylinder and ground speed were 23%, 400 rpm and 1.2 ms\(^{-1}\), respectively. They had minimum total loss which WAS 1.55%, 2.65% and 2.34%, respectively. The results also show that there was an ear loss in preharvest loss (because of bad weather condition) that was 0.95-5.42%, also kernal loss on the header and cylinder loss which all related to improper adjustment of combine but total loss was in an acceptable level and standard. It was variable from 1.55% to 4.02%. Other parameters such as using inexperienced driver, improper combine adjustment, and also nonuniformity of field and ear moisture content in different parts of field prevent using the outputs and recommendations of this research.

**Keywords:** Combine losses, Corn, Harvesting, Measurement
Using Failure Mode and Effect Analysis (FMEA) for Performing Good Ploughing with Mouldboard

M. Namdari¹ - Sh. Rafiee² - A. Jafari³
Received: 8-6-2010
Accepted: 22-2-2011

Abstract

Farm management needs creative methods to success. FMEA (Failure Modes and Effects Analysis) is a new method to analyze potential reliability problems in the development cycle of the project, making it easier to take actions to overcome such issues, thus enhancing the reliability through design or process. Anticipating these failure modes, being the central step in the analysis, needs to be carried on extensively, in order to prepare a list of maximum potential failure modes. Risk is measured in terms of Risk Priority Number (RPN) that is a product of occurrence, severity, and detection difficulty. This study attempted to improve clod mean weight diameter and soil inversion as indicators of tillage quality by FMEA methodology. The results showed that low soil moisture, slow speed of ploughing and great depth of ploughing is the most important factors that increase clod MWD with 900, 630 and 560 RPN, respectively. Also for soil inversion the slow speed of ploughing, not using coulter, low soil moisture and great depth of ploughing are important factors with 720, 648, 490 and 420 RPN. Using a split - split factorial experiment with 16 treatments and three replications also acknowledged the results of this method. After reforming the conditions and re-testing the experiment, results showed that clod MWD was reduced 20% and soil inversion increased 2% approximately. This study proposes the use of this technique in agricultural management.

Keywords: Clod mean weight diameter, Failure modes and effects analysis, Soil inversion, Tillage

¹,²,³- MSc Student and Associate Professors, Department of Agricultural Machinery, Faculty of Agricultural Engineering and Technology, Tehran University, Respectively
(*-Corresponding Author Email: majidnamdari@gmail.com)
Construction and Assessment of an on the Go Soil Electrical Conductivity Mapper

J. Baradaran Motie1* - M.H. Aghkhani2 - M.H Abbaspour Fard3 - A. Lakzian4

Received: 14-8- 2010
Accepted: 26-1-2011

Abstract

The issue of soil salinity is one of the snags for increasing agricultural productivity, which must be inhibited by appropriate devise and scientific management. One way to identify salty areas of farm lands is to prepare salinity maps. In this study, a prototype soil apparent electrical conductivity measuring and mapping device, was designed and built. This device employs direct contact method of electrodes with soil (Also called Wenner method). The system inputs include power supply voltage, location signal from a GPS receiver and signal of voltage between the electrodes. The outputs include the apparent electrical conductivity with respective to geographical coordinate that created in a TEXT file, and then transmitted through a RS-232 serial port to a PC. Electrical conductivity data calibrated and mapped using ESAP-95 software package. To evaluate the device, electrical conductivity map of a land with area of 0.8 Ha surveyed in two ways: using the on the go EC mapper and capturing soil samples manually. The results of these two methods were then compared. Assessment of the device in a clay-loamy soil with low salt level, showed a good correlation with the laboratory EC, having mean error (ME) of -15.27 μS.cm⁻¹. Point to point comparison between surveyed data and laboratory EC’s showed that in 67 percent of measurements the errors were under 10 percent. These errors are acceptable mainly due to unknown soil variables and in comparison with other research findings.

Keywords: Electrical conductivity, EC map, Regression model, Soil salinity

1, 2, 3- MSc Student, and Associate Professors Department of Agricultural Machinery Agriculture Faculty, Ferdowsi University of Mashhad, Respectively
(*-Corresponding Author Email: jalal_jbm@yahoo.com)
4- Associate Professor, Department of Soil Science, Agriculture Faculty, Ferdowsi University of Mashhad
Investigation the Rototiller Blade Operational Factors on the Soil Tillage of Orchard and Paddy Fields

R. Tabatabae Koloor\(^1\) - Gh. Kiani\(^2\)

Received: 17-8-2010
Accepted: 14-3-2011

Abstract

In recent years using rototillers in orchards and small fields especially in northern areas of Iran has been increased. In this study, a multi-function rototiller was developed and its performance was analyzed and evaluated in the field conditions. The specifications of this machine were determined according to the standard and operational situation. The calculations were performed for determining the rotor speed at different gears and then power transmission system was designed. Theoretical analysis was conducted to investigate the machine forward speed and blade rotational speed on the quality of rototilling operation. Results indicated that the forward speed and blade rotational speed affected the thickness of soil cut layer and soil crushing rate. Field tests were performed to determine the thickness of soil cut layer and soil crushing rate for orchard and paddy field conditions. In addition, some physical properties of soil such as composition, moisture content, weeding height, and DENSITY at 15 cm depth were measured. Data analysis was performed by Completely Randomized Design (CRD) with factorial test 3×3 at three replications. Duncan test presented the best combinations of forward speed and blade rotational speed for thickness of soil cut layer were 0.4 ms\(^{-1}\) and 50 rpm, respectively. Also, the best combinations of these two factors for soil crushing rate lower than 40 mm were 0.2 ms\(^{-1}\) and 110 rpm, between 40-80 mm; 0.3 ms\(^{-1}\) and 50 rpm and higher than 80 mm; 0.4 ms\(^{-1}\) and 50 rpm, respectively.

Keywords: Rototiller, Soil tillage, Soil crushing rate

---

1- Assistant Professor, Department of Farm Machinery, Sari Agricultural Sciences and Natural Resources University
\(\ast\) -Corresponding Author Email: r.tabatabaei@sanru.ac.ir

2- Assistant Professor, Department of Agronomy and Plant Breeding, Sari Agricultural Sciences and Natural Resources University
Multi-Criteria Decision Making Based in Choosing an Appropriate Tractor

(A Case Study for Hamedan Province)

M.B. Lak¹ - A.M. Borghaei²

Received: 23-8-2010
Accepted: 13-4-2011

Abstract

Agricultural mechanization goal is to maximize the utility. Establishment of subsidies systemization and Iran incorporation with World Target Organization (WTO), choosing an appropriate technology will be more important. Agricultural development is due to correct mechanization and choosing an appropriate tractor is one of mechanization implementation bases. In the paper, criteria involved in choosing an appropriate tractor were considered according to Hamedan province conditions and the best choice between 11 tractor models was selected regarding to 9 criteria which were analyzed by Technique for Order-Preference by Similarity to Ideal Solution (TOPSIS). The criteria are: drawbar power, hydraulic power, power take off (PTO) power, PTO shaft, specific fuel consumption (SFC), speed range, engine standard round per minute, gearbox, and manufacturer. Between the choices, U453 was preferred and recommended as appropriate tractor.

Keywords: Tractor test, Agricultural mechanization, Weighting, TOPSIS

¹ - Member Young Researchers Club, Science and Research Branch, Islamic Azad University, Tehran
(*-Corresponding Author Email: mbagher_lak@yahoo.com)
² - Professor, Department of Agricultural Machinery, Science and Research Branch, Islamic Azad University, Tehran
Brief Report

Study on Agricultural Mechanization Indexes of Small Farms in Khorasan Razavi Province and Suggesting Possible Improvement

M. H. Saiedirad\(^1\) - S.A. Parhizgar\(^2\)

Received: 15-7-2010
Accepted: 16-4-2011

Abstract

The major part of agriculture in Iran and especially in Khorasan province is yeoman farmers, and often the parts are less than one hectare. To evaluate the status of small farm mechanization (less than two hectares) in Khorasan Razavi province, three agricultural sub-regions that running small farms were identified. This research was carried out in 2009. The questionnaire was prepared for gathering basis and field information to determine the mechanization coefficients. The questionnaires were completed for total number of farmers in the areas studied. Results showed that mean of mechanization level and total mechanization degree were 3.36 hp per hectare and 37.7 percent respectively. The mean of mechanization degree in tillage was calculated 98.3 percent. The mean power coefficient and the average hectare per tractor were 4.37 and 27.62 respectively. The farmers only use power available for the tillage in these regions. They were not able to use of tractors in other operations, because of being small farm, lack of technical knowledge and lack of implements. Development of mechanization cooperatives, training of farmers and conformity of machine and farm area can increase mechanization indexes and to decrease production costs.

Keywords: Agricultural Mechanization, Small Farms

---

1 - Assistant Professor Khorasan Agricultural and Natural Resources Research Center
(*-Corresponding Author Email: Saiedirad@yahoo.com)
2- Agricultural Mechanization expert Khorasan JAHAD – E- AGRICULTURE Organization