



**Abstract of Research Reports
Agricultural Machinery &
Mechanization Engineering**



2019

No.	Title	Page
1	Design and Development of an Optical System for Non-destructive Detection of Ectomyeloid Ceratoniae Zeller (Lep. Pyralidae) Infected Pomegranates	1
2	Assessment and Field Performance Evaluation of Legumes Combine to Harvesting Rain Fed Chickpea	2
3	Study on Energy Consumption, Technical Efficiency Analysis and Environmental Impacts for Rice Production by Using Life Cycle Assessment Methodology	3
4	Codification & Development of a Geographic Information System for Dubas Bug (Ommatissus Ybicus) in Bam Region, in Order to Monitoring and Site Specific Insect Management	4
5	Date Palm Spraying Using New Technology Of Sprayer Drone	6
6	Study and Evaluation of Energy Consumption, Economic Analysis and Environmental Impacts Effects of Irrigated Wheat Production in Iran	7
7	The Effect of Merus Ring Technology to Reduce Emitter Clogging in Drip Irrigation System under Field Condition	9
8	Determination of the Optimum Magnitude of Tillage in The Planting and Rationing of Sugar-Cane in Khuzestan	10
9	Technical, Economical and Energy Use Evaluation of Irrigation Pumps Used by Farmers in Khuzestan	11
10	Technical-Economic Evaluation of Performance Seed Corn Combine (Picker Husker) In Moghan	12
11	Effects of Furrow Opener Type and Press Wheel Configuration of Direct Drill Planter on Seeding and Crop Performances in Wheat Cropping	13
12	Technical and Economical Evaluation of Red Pepper Solar Drying in Davarzan	14
13	Evaluation of Energy Consumption in Safflower and Maize Production in East Azerbaijan Province	15
14	Joinder of Proper Tillage Attachments in Front of Row Crop Planter for Jointly Strip Tillage and Planting Operations	16
15	Determination of Appropriate Apple Harvesting Machine	17
16	Effect of Planter Type and Seed Variety on Seedling Emergence Uniformity and Irrigated Seed Cotton Yield in Fars Province	18
17	Technical and Agronomic Comparison of Transplanting (Mechanical Transplanter) and Seed Drilling of Cotton under Different Tillage Methods	19
18	Evaluation the Influence of Conservation Tillage Methods on Severity of the Dominant Soil-Borne Diseases and Potato Yield	20
19	Comparison and Evaluation of Mechanized, Semi-Mechanized and Traditional Picking Safflower Petals	21
20	Attaching of Seed Drill with Heavy Disc Harrow and Farm Evaluating for Wheat Cultivation	22
21	Measurement of Combine Harvesting Losses of Wheat in Iran to Introduce their Reduction Solutions	23
22	The Spread Pattern of Injected Liquid into the Soil as Affected by Soil Aeration	26
23	Application of in-furrow Seed Drill in Mechanized Wheat Cultivation to Increase Water Use Efficiency in Saline Soil Conditions	27
24	Technical and Agronomical Evaluation of Tarashkadeh Co. Raised Bed Seeder Machine for Wheat Seeding	28

Design and Development of an Optical System for Non-destructive Detection of *Ectomyelois Ceratoniae* Zeller (Lep. Pyralidae) Infected Pomegranates

B. Jamshidi*, A. Hemmati, A. Mahmoudi
Email: b.jamshidi@areeo.ac.ir

Location: Agricultural Engineering Research Institute Headquarter, Alborz Province

Abstract

The carob moth, *Ectomyelois ceratonia* Zell. (Lepidoptera: Pyralidae), is the most important pest of pomegranate in the Middle East, especially in Iran, attacking the fruits before and after harvest and causing 30-80 percent yield losses. The damage caused by larvae, especially from second or third age, on the fruit is due to their feeding from internal parts of pomegranate without external symptoms. This causes penetration of pathogenic fungi which makes the fruits unmarketable and unfit not only for human consumption but also for the food processing industries. Moreover, the existence of hidden contamination in pomegranates is a vital challenge for the exportation. Therefore, development of a fast and non-destructive detection technique of infested pomegranates is imperative. In this research, an optical system was developed for fast and non-destructive detection of carob moth infestation in pomegranates during hidden activity of the larvae. This system was designed based on two appropriate optical methods for collecting Vis/NIR spectral information of both healthy and infected pomegranates. To this end, some fruits were artificially contaminated to the carob moth larvae. Optical information of the blank samples and the contaminated pomegranates without and with external visual symptoms of larvae infestation were analyzed one and two weeks after contaminating the samples. For each optical method, a powerful supervised pattern recognition algorithm was used to classify the samples based on the spectral information. User-friendly software as a graphical user interface (GUI) was created based on the selected optical method and the best models developed for discrimination of the pomegranates into healthy and unhealthy (without and with external visual symptoms) classes in each optical method. Evaluation of the system indicated very good performance for discrimination of healthy and unhealthy pomegranates, Malas Saveh (accuracy of 90%). It was concluded that the designed system and software can be used for fast, low-cost and non-destructive screening and preliminary health control of the pomegranates. Nevertheless, further works should be considered on other varieties of pomegranates at different regions which naturally contaminated to carob moth larvae for adapting the system to detect carob moth infestation during hidden activity of the larvae.

Key words: Carob Moth, Laser Diode, Near-infrared, Non-destructive, Optic, Spectroscopy

AERI

Assessment and Field Performance Evaluation of Legumes Combine to Harvesting Rain Fed Chickpea

M. R. Mostofi*, M. Safari, F. Amir-Shagagi, F. Rasoli, and E. Fayazi

Email: mostofi08@gmail.com

Location: Agricultural Engineering Research Institute Headquarter, Alborz Province

Abstract

Legumes with more than 700 thousand hectares are the most important crops in the country. Currently, legumes have a mean consumption of 4.8 kg, although their consumption is lower than the average world (6.6 kg) and is 7.8 kg promising a head, but at the same time plays an important role in Feeding people. Harvesting grains and especially rain-fed chickpeas are often harvested manually and with great time and money because of lack of access to a suitable machine. Crop losses because of plant characteristics, farm conditions and nonconformity of machines with product conditions. Therefore, to assess complying the new ONER combine harvester imported from Turkey is important for the harvesting of rain-fed chickpeas. In this research, to perform a new combine harvester for rain-fed chickpea harvest in the fields of farmers in the region is studied and evaluated. Experiments were carried out in strip plot design with five repeats. The horizontal factor is combine speed, and vertical factor is variety. The test will be on the farmland and the minimum length of the plantations is 25-30 meters. The crop features that are measured and considered are: plant height, plant width, number of plants per hectare, 100 seed weight, height of the first pod of soil, and grain moisture content. Cropping density, harvest coefficient. The technical evaluation features are: harvesting rates in machine and hand harvesting; gathering and processing loss, quality losses, distance between threshing cylinder and concave, forward speed and drum speed, and combine capacity. The results show that minimum total combine loss is 4.37% in engine speed of 1500 rpm or 3-3.5 km/s traveling speed. Also, total harvest loss is 10.42%. Minimum quality loss is gained 4.88%. The results of economical features analysis show the cost of hand harvesting is 4.8 times more than combine harvesting. Annual income of combine harvesting is 84 and cost of it, is 249.69 million Rials. Finally the profit/cost ratio is 3.36 so mechanized harvesting using the chickpea combine have economical affect and its purchase price will be depreciated during two crop years.

Keywords: Combine Harvesting, Legumes, Mechanized Harvesting, Rain Fed Chickpea

AERI

Study on Energy Consumption, Technical Efficiency Analysis and Environmental Impacts for Rice Production by Using Life Cycle Assessment Methodology

A. Vahedi*, Z. Yousefi, S. Rahmani, A. Gholian, and F. Askari bozayeh

Email: vahedi_adel@areeo.ac.ir

Location: Research Center for Agriculture and Natural Resources of Gilan Province

Abstract

Today's, agricultural sector, to meet ever increasing food need of world growing population, depends on input energy consumption. It is clearly that supply of input energy requirements such as fuel, fertilizers, chemicals, human and animal power, machinery, seed, and electricity, spend the cost in crop production, so, for producing a given amount of an agriculture crop with higher energy input, means more cost and less income per each unit of that produced crop. The current study has been done with the objects of evaluating of consumed inputs and crop yield, input and output energy, energy indices, economic indices, systems efficiency and environmental impacts for paddy production in two provinces of Mazandaran and Guilan. For this purpose, required information gathered via study of documents, interview with experts and leading farmers, and questionnaire completion by the irrigated wheat farmers in different cities of each understudy province. Then, by help of equivalent energy equations, input and output energy and energy indices were calculated, and Data Envelopment Analyses was used to evaluate the energy production process. Also, the economic analysis was done by calculating inputs cost and output gain. For determining environmental impacts of paddy production, Life Cycle Assessment Approach was used. According the results, total input energy of Mazandaran and Guilan provinces were 91061.5, and 88064.06 MJ/ha respectively, while the output energy for those provinces were 100967.954, and 68067.21 MJ/ha respectively. The maximum share of energy input for Mazandaran and Guilan provinces was regarding to fuel with amounts of 41.27 and 44.78 percent respectively. Output/input energy ratios for Mazandaran and Guilan provinces were 1.1, and 0.77 respectively, and energy productivities were 0.058, and 0.040 kg/MJ respectively. Net profit of paddy production in understudy provinces was 105.738 and 102.776 million Rials. In Mazandaran and Guilan provinces for one ton of paddy production, effect of Global Warming Potential(GWP) were 3272.06 and 1116.61 kg CO₂ eq. respectively, index of Acidification Potential (AP) were 20.82 and 6.25 kg SO₂ eq. respectively, and index of Terrestrial Eutrophication Potential(TEP) 14.89 and 9.84 kg NO_x eq. respectively. Depletion of fossil resources in understudy provinces were 5444.90, and 7587.21 MJ respectively. Depletion of phosphorus resources were 2.45, and 2.15 kg P₂O₅ eq. respectively. Depletion of potash resources were 0.83 and 0.62 kg K₂O eq. respectively. Depletion of water resources were 2956.63 and 3354.06 m³ respectively. Finally, Environmental index(Eco-index) were obtained as 1.473 and 0.579 respectively, and Resources Depletion Index(RDI) were 1.563, and 1.705 respectively.

Keywords: Energy, Data envelopment analysis, Economic analysis, Life cycle assessment, Paddy

Codification & Development of a Geographic Information System for Dubas Bug (*Ommatissus Ybicus*) in Bam Region, in Order to Monitoring and Site Specific Insect Management

M. A. Rostami, N. Taheri and A. Pejman

Email: marostami1351@gmail.com

Location: Research Center for Agriculture and Natural Resources of Kerman Province

Abstract

Thousands of hectares of Bam date palms are now infested with Dubas bug and this pest causes a lot of loss every year. So far, the fight against this pest has been carried out through aerial spraying, and this method of fighting, besides the destructive effects on human health, has also caused damage to the environment. Dubas bug has been expanding in recent years and has grown rapidly due to its favorable conditions. It is useful to have information about pests and plant diseases in implementing policies related to agricultural promotion, designing appropriate methods of fighting, insurance services, and promoting managerial and supervisory practices. GIS is a computer system for storing, processing and displaying land reference data. This system is used as a tool for helping decisions in product management. The results of research on pest control and monitoring indicate that the guidelines based on grounded and land-based samples have had very beneficial effects. In this study, the technology of GIS was used as a quick and easy solution for the observation of date palm pests. The aim of this study was to prepare a digital map of the spatial pattern of spreading Pest Dubas bug. In Bam's spit, prepare a map of pest trap density and identify pest density sites, determine the extent of infection and determine the surface ratio of pest infestation. This research was implemented in three stages. In the first stage, the gardens of the study area were lattice-grooved, from each cell of a garden, and in total, 41 grassland densities were measured by pest counting and honeydew droplet counting. In the second stage, the collected data entered the GIS, then the third stage of the information was extracted from the system and the maps were examined. The results showed that in most gardens where pest density was measured, the damage was moderate and high. In more than 69% of the gardens, the density of cobblestone was moderate, high and very high. For this reason, it can be said that more than 69% of the gardens in the area need urgent action to combat pests. These gardens should also be integrated into garden design and improvement, such as reducing tree density, pruning and combating. The severity of pest infestation in the northeastern and southeastern shores and generally in the east and south of the region is much higher than the northwest of the area. Therefore, the focus of the fight should be 58 degrees and 22 minutes east longitude and 29 degrees 7 minutes northern latitude to 58 degrees and 29 minutes east longitude and 29 degrees 2 minutes northern latitude. The elevation map of the study area shows; from southern Brovat to the north of the palm trees of the Bam area, at a distance of 21.5 km, the altitude increased from 975 m to 1190 m. With the advance south of the Brovat area to the north of Bam, the severity of pest density has decreased. From the results, this level of information can be ascertained that as the altitude increased, the severity of the pest decreased. The total area

of the palm trees of the Bam and Brovat area was calculated with the help of satellite image of Sentinel 2 and controlled by the classified classification and estimated 3647 hectares.

Keywords: Date Palm, Geographic Information System, Honeydew, Map, Precision Farming



Date Palm Spraying Using New Technology of Sprayer Drone

M. Safari*, A.shaikhi, H.Sharifnasab and N.Bagheri

Email: email2safari@yahoo.com

Location: Agricultural Engineering Research Institute Headquarter, Alborz Province

Abstract

The conventional method of spraying dates palm trees for combating cicala is using of tractor lance sprayers, due to the high altitude of the trees, the pressure of spraying must be very high to reach poisonous solution to the desired height, due to increasing of the pressure, Poison drops are more powdered and as a result, drift and poison consumption increases in ha. In this method, the poison solution is practically put on the operator, which, in addition to high consumption of poison, also contaminates the environment. Utilizing the new drone technology in spraying against date palm cicala can be a way to reduce the disadvantages mentioned. In this research, three different treatments were used to control the date cicala during a randomized completely block design with four replications. The experimental treatments were 1- Spraying with sprayer drone 2-Spray with tractor lance sprayer 3- Witness (no spraying). The results showed that there was a significant difference between experimental treatments at 5% level. In tractor lance sprayer and sprayer drone, the highest and lowest consumption of poisonous solution was 437.7 and 14.46 liter/ha respectively, the drift was 42.6 and 11.02%, the field capacity was 5.55 and 0.8 ha per hour respectively. There wasn't any significant difference between sprayer drone and tractor lance sprayer treatment in 3 days after spraying in terms of effectiveness, but this difference was significant in 7 days after spraying and the sprayer drone method was preferable. The spray quality coefficient in the drone sprayer was 1.35. The energy consumption of the tractor lance sprayer was 1.66 times higher than that of the sprayer drone. In terms of economically, The benefit-cost ratio were 2.96 and 4.2 in drone sprayer and lance sprayer respectively that showed the lance sprayer was better than drone sparyer . However, two methods were capable to return capital over a period of one month (up to a maximum of 6 months).

Keywords: Cicala, Drone, Palm Tree, Spraying

AERI

Study and Evaluation of Energy Consumption, Economic Analysis and Environmental Impacts Effects of Irrigated Wheat Production in Iran

A. Vahedi, J. Taghinazhad, M. Heidarisolatanabadi, S. Zarifneshat, S. Abbassi, J. Habibiasl, H. Sadeghnezhad , A. Jafari, and M. Naziri
Email: vahedi_adel@areeo.ac.ir

Location: Research Center for Agriculture and Natural Resources of Alborz, Ardabil, Isfahan, Hamedan, Golestan, Khorasan Razavi and khozestan Provinces
Province

Abstract

Today's, agricultural sector, to meet ever increasing food need of world growing population, depends on input energy consumption. It is clearly that supply of input energy requirements such as fuel, fertilizers, chemicals, human and animal power, machinery, seed, and electricity, spend the cost in crop production, so, for producing a given amount of an agriculture crop with higher energy input, means more cost and less income per each unit of that produced crop. The current study has been done with the objects of evaluating of consumed inputs and crop yield, input and output energy, energy indices, economic indices, systems efficiency and environmental impacts for irrigated wheat in seven provinces of Alborz, Isfahan, Ardebil, Khorasan-e Razavi, Khuzestan, Golestan, and Hamadan. For this purpose, required information gathered via study of documents, interview with experts and leading farmers, and questionnaire completion by the irrigated wheat farmers in different cities of each understudy province. Then, by help of equivalent energy equations, input and output energy and energy indices were calculated, and Data Envelopment Analyses was used to evaluate the energy production process. Also, the economic analysis was done by calculating inputs cost and output gain. For determining environmental impacts of irrigated wheat production, Life Cycle Assessment Approach was used. According the results, total input energy of Alborz, Isfahan, Ardebil, Khorasan-e Razavi, Khuzestan, Golestan, and Hamadan provinces were 45458.84, 92714.8, 38755.34, 104701, 50971.2, 26198, and 49362.64 MJ/ha respectively, while the output energy for those provinces were 162169.28, 131958.8, 77381.39, 122297, 141901.2, 134106, and 125511.69 MJ/ha respectively. The maximum share of energy input for Alborz, Ardebil, Khuzestan, Golestan, and Hamadan provinces was regarding to chemical fertilizers with amounts of 43.06, 40.76, 57.40, 38, and 53.81 percent respectively, while irrigation energy requirement had maximum share in Isfahan and Khorasan-e Razavi with 60.01 and 56.66 percent respectively. The minimum share of energy input for Alborz, Isfahan, Ardebil, Khorasan-e Razavi, and Golestan provinces calculated for human energy requirement with amounts of 0.39, 0.19, 0.79, 0.18, and 0.26 percent respectively, while in Khuzestan and Hamadan, chemicals consumed the lowest energy with 0.48 and 0.89 percent respectively. Share of direct energies for all understudy provinces, were 44.61, 69.25, 39.88, 67.76, 26.52, 40.22, and 28.48 percent, share of indirect energies were 55.39, 30.75, 60.12, 32.24, 73.48, 59.78, and 71.52 percent, share of renewable energies were 27.99, 60.20, 31.01, 58.79, 17.08, 34.92, and 9.24 percent, and share of nonrenewable energies were 72.01, 39.80, 68.99, 41.21, 82.92, 65.08, and 90.76 percent respectively. Output/input energy ratios for Alborz, Isfahan, Ardebil, Khorasan-e Razavi, Khuzestan, Golestan, and Hamadan provinces

were 3.57, 1.42, 1.99, 1.17, 2.81, 5.65, and 2.57 respectively, and energy productivities were 0.27, 0.10, 0.142, 0.08, 0.21, 0.17, and 0.18 kg/MJ respectively. Net profit of irrigated wheat in understudy provinces was 30.646, 32.968, 20.253, 69.781, 35.830, 35.762, and 41.655 million Rials, ratio of benefit to cost was 1.64, 2, 1.52, 4.06, 2.4, 2.938, and 1.99, and rate of return to scale were calculated as -0.698, -1.14, 0.608, -8.548, 1.11, 0.47, and 0.608 respectively. In Alborz, Isfahan, Ardebil, Khorasan-e Razavi, Khuzestan, Golestan, and Hamadan provinces in the approach of constant return to scale, 6, 4, 25, 7, 4, 14, and 17 units were efficient and 16, 18, 75, 17, 46, 21, and 12 units were no efficient respectively, and in the approach of variable return to scale, 10, 20, 93, 20, 50, 21, and 25 units were efficient and 10, 4, 7, 4, 0, 14, and 4 units were no efficient respectively. The highest effect on Global Warming Potential (GWP) was for releasing of N₂O and potential of Acidification and Terrestrial Eutrophication was for NH₃. In Alborz, Isfahan, Ardebil, Khorasan-e Razavi, Khuzestan, Golestan, and Hamadan provinces effect of Global Warming Potential were 526.4, 996.8, 590.74, 599.89, 947.66, 467.35, and 561.15 kg CO₂ eq. respectively, index of Acidification Potential (AP) were 2.537, 5.4, 2.73, 2.75, 4.29, 5.79 and 2.57 kg SO₂ eq. respectively, and index of Terrestrial Eutrophication Potential (TEP) were 5.54, 8.2, 6.42, 6.46, 10.49, 14.76 and 6.04 kg NOX eq. respectively. Depletion of fossil resources in understudy provinces were 1750.27, 2213.4, 1251.05, 1231.86, 1545.51, 2903.6, and 644.02 MJ respectively. Depletion of phosphorus resources were 2.908, 2.34, 1.76, 1.62, 2.90, 2.95, and 4.73 kg P₂O₅ eq. respectively. Depletion of potash resources were 0.886, 0.55, 0.13, 0.34, 0.88, 0.7, and 0.44 kg K₂O eq. respectively. Depletion of water resources were 877.68, 2193.2, 1092.43, 1082.63, 891.18, 629.5, and 699.46 m³ respectively. Finally, Environmental index(Eco-index) were obtained as 0.279, 0.5, 0.313, 0.31, 0.504, 0.588, and 0.295 respectively, and Resources Depletion Index(RDI) were 0.833, 1.18, 0.684, 0.66, 0.830, 0.783, and 1.01 respectively.

Key words: Economic Analysis, Energy Indices, Irrigated Wheat, Life Cycle Assessment, Optimization



AERI

The Effect of Merus Ring Technology to Reduce Emitter Clogging in Drip Irrigation System under Field Condition

E. Dehghan, M. Akbari, N. Kohi Chelekaran, H. Bayani, M. A. Rostami, A. Yonesi, Z. Ghafari, S. Hoseizadeh Ajirlo and H. Serajeh
Email: elyas_dehghan@yahoo.com
Location: Alborz, Tehran and Kerman pavinces

Abstract

Drip irrigation system is one of the most advanced methods for improving water productivity, but emitter clogging due to chemical, biological and physical factors is one of the most important barriers to its expansion in the country. In Drip irrigation systems several methods have been used to prevent clog emitters. But, so far none of them have been able to fully overcome the problem. This study was carried out From April 2017 for 18 months to evaluate the effect of the new technology of Merus Ring (MR) on reducing the chemical emitter clogging, discharge variations and uniformity of water distribution in a drip irrigation method, in conditions of gardens equipped with drip irrigation system in Alborz, Tehran and Kerman provinces. In each province, one of the farmers' gardens in the area that had a problem with emitter clogging was selected. Each garden was divided into two parts. In the first part, the MR, whose diameter is proportional to the irrigation tube and the type of molecular fluctuations suitable for irrigation water characteristics, was proposed by the manufacturer and installed on the irrigation tube. In the second part, which was considered as a control, the trees were irrigated with the existing drip irrigation system without the application of the MR. In the both parts, a section of the drip irrigation system was equipped with new Eurodrip and Micro Flapper droplets, and in the rest of the system, existing droplets were used. The results showed that the Eurodrip droplets in conditions with and without MR technology had a uniform distribution of water above 80%, and this uniformity was maintained by two irrigation seasons, but the uniformity of distribution of water reduced in other kinds of droplets after an Irrigation season. Also, the results of this study showed that at the end of the two irrigation seasons, the uniformity of water distribution under conditions with and without MR was slightly reduced in all places and emitters. But this reduction is not so much that it can be said with certainty that this technology has no effect on the prevention of chemical emitters clogging. In general, the results of this study suggest that, based on the two-year data available, it can not be said about the ability or disability of the MR technology to eliminate chemical emitters clogging or to prevent their eclipse. Therefore, in order to reject or accept the existence of this capability in the MR, it is suggested that this technology be evaluated for a longer time in different areas.

Keywords: Chemical Clogging, Drip Irrigation, Emitter, Merus Ring

AERI

Determination of the Optimum Magnitude of Tillage in The Planting and Rationing of Sugar-Cane in Khuzestan

S. R. Ashrafi Zadeh*, B. Lotfian, M. R. Arefi Nejad

Location: Research Center for Agriculture and Natural Resources of Khuzestan Province

Abstract

Sugar cane is one of the most important industrial plants which is planted in different parts of the world to provide sugar. In the province of Khuzestan in Iran, more than 120 hectares is planted under sugar cane. For soil preparation, traditionally it is a must to use one or more times subsoiler to remove hard pan of soil in order to achieve higher yield. Soil subsoiling is expensive, time and energy consuming, and reduces tillage speed. On the other hand, some experts believe that there is no need of applying such deep tillage for sugar cane. Therefore, to determine the optimum magnitude of tillage at planting and ratooning stages of sugar cane in Khuzestan province, the current project was conducted as a split plot with a randomized complete block design in three replicates during 1992-95 in Hakim Farabi agro-industry Company of Khuzestan. Tillage methods (A) at three levels as main plots: a1) Conventional tillage including: pre planting irrigation + initial disk + Moldboard plow + disk (if required) + two times subsoiler + two to three times disking + one or two times laser leveling + furrowing+ Fertilizing + planting, a2) pre planting irrigation + initial disk + Moldboard plow + two times disking, laser leveling + furrowing+ Fertilizing + planting, and a3) pre planting irrigation+ two times disking +laser leveling + furrowing+ Fertilizing + planting . IN addition, ratooning (B) as sub plot in three different levels as b1) burned harvest at optimum moisture content+ conventional ratooning (subsoiling, disking, reshaping), b2) burned harvest at optimum moisture content+ ratooning with a combined ratooning machine (accomplished three jobs at one pass), and b3) no ratooning. Analysis of variance showed no significant difference among tillage methods during three years of conducting the project. In spite, there was a significant difference among ratooning methods at 1% level as b1 and b2 showed a significant higher yield compared to b3. Interactions between tillage and ratooning methods showed a significant difference at 5% level. Considering no sign of priority of deep tillage, and in particular subsoiling, on sugar cane yield, and considering higher energy, cost and time, results of this project strongly suggest to leave this kind of deep tillage for sugar cane and rely on shallow tillage such as disk harrows for soil preparation of this plant.

AERI

Technical, Economical and Energy Use Evaluation of Irrigation Pumps Used by Farmers in Khuzestan

J. Habibi Asl*, A. Azizi, and V. Yaghoobi

Email: jhabibi139@yahoo.com

Location: Research Center for Agriculture and Natural Resources of Khuzestan Province

Abstract

This study was conducted in Khuzestan Agriculture and Natural Resources Research and Education Center on 50 numbers of irrigation pumps owned by the farmers for wheat cultivation. The target farmers were in Karoon and Karkheh rivers basin in the cities of Ahwaz, Karoon, Bavi, Shooshtar, Hamidiyeh, Dasht-e-Azadegan and Hoveyzeh. Half of the evaluated pumps were running by diesel motor and the others were running by electrical motor. Some information included cultivated area, planting pattern, irrigation method, landing level, transfer water system, irrigation cost, pump type, pump lifetime, were collected by interview with the pump owners. Other parameters, such as pump efficiency, energy consumption, and economic evaluation were measured and calculated. The interview results showed that the most problems of diesel pumps were access to fuel (93%), service and maintenance (87%), and fuel cost (75%) respectively. In case of electrical pumps, 100% of the owner's complainant from setup cost and getting operating license, while the other challenges were shortage of water allocation (56%), electricity cost (56%), and water cost (17%) respectively. The results showed the mean efficiency of diesel and electrical pumps were 80.2% and 74.5% respectively. Also, the energy used by diesel and electrical pumps for irrigating one hectare of wheat were calculated 7883 MJ/ha and 3532 MJ/ha respectively. Economic evaluation showed that irrigation cost of diesel pumps were more than that of electric pumps. Finally, according to the obtained results recommended replacing the diesel pumps by electrical pumps as much as possible. Also, increasing the covered area for each pump leads to chopping irrigation costs.

Keywords: Economic evaluation, Efficiency, Energy consumption, Irrigation pump, Technical evaluation

AERI

Technical-Economic Evaluation of Performance Seed Corn Combine (Picker Husker) In Moghan

J. Taghinazhad*, and V. Esmaeili

Email: taghinazhad55@gmail.com

Location: Research Center for Agriculture and Natural Resources of Ardabil Province

Abstract

One of the most challenges in hybrid Maize Seed was harvesting direct by self-combine cereal harvest. The objectives of the current study were determined and evaluated economical - Technical parameters for picker-husker auto-harvester maize seed. The split plot experimental design based on the randomized complete block design (RCBD) was used to evaluate treatments with three replications. The main plot was seed moisture content at three levels such as 29, 25 and 21 percent. The sub-plot was the harvesting corn of different methods at four levels (A: by picker-husker auto-harvester, B by PTO connected picker, C: by workers and D: direct harvest by cereal combine for harvesting of maize seed production. The results showed that the effective field capacity of the picker-husker auto-harvester and PTO connected picker was 1.17 and 0.2 ha per hour, and the capacity of combin was 0.99 and 0.17 tons per hour, respectively. The least cracking of the seed in the manual method is 3.66%. The mean cracking of seed in harvest with picker-husker auto-harvester and PTO connected picker was 7.11 and 7.7%, respectively. The highest mean fracture was found to be 15.66% in conventional combin .According to the results, hybrid maize seed harvesting by picker-husker auto-harvester, PTO connected picker and harvesting by hand are most profitable methods, respectively. Result shoood the mean cracking of seed in harvest with picker-husker auto-harvester and PTO connected picker was 7.11 and 7.7%, respectively. The highest mean fracture was found to be 15.66% in conventional combine. So, currently harvesting by picker-husker is most economic and profitable harvest method, all of physical and physiological quality characters and storability was significantly higher than conventional method. Economic survey results with budgeting method showed that harvesting corn seed with a new self-propelled was the most profitable technique for farmers and the most suitable moisture content during harvest was 25%. Because of the early harvesting and the lower damage to the quality of the seeds rather than the conventional method.

Key words: Hybrid maize, seed quality, Picker Husker harvesting, Technical and Economic analysis

AERI

Effects of Furrow Opener Type and Press Wheel Configuration of Direct Drill Planter on Seeding and Crop Performances in Wheat Cropping

M. Roozbeh*, A. Khosravani Gashtasb

Email: roozbeh.majid@gmail.com

Location: Research Center for Agriculture and Natural Resources of Fars Province

Abstract

The furrow opener type and press wheel configuration in no-till seeders can have a major effect on crop emergence in conservation tillage systems. This is particularly important in annual double-cropping regions (winter wheat and summer maize) of Fars province south where large volumes of residue remain on the soil surface after maize harvesting. Therefore, a field study was conducted to determine the effects of furrow opener type and press wheel configuration on sowing performance and subsequent wheat yield in rotation with corn. The experimental design was a randomized complete block in four replications. The treatments consisted of four different configurations for no-till seeder: no-till seeder with tine opener without press wheel (Notil.1), no-till with tine opener and press wheel (Notil.2), no-till with disk opener without press wheel (Notil.3), no-till with disk opener and press wheel (Notil.4), and conventional planter with shovel opener and press wheel (Con.Dril). Residue management systems were in four levels of leaving (R.M1), removing (R.M2), chopping (R.M3) and disking (R.M4). The results showed that furrow opener type and press wheel configuration had a significant effect on planting depth, speed of emergence, depth uniformity and crop yield. The Noti.1 and Noti.2 treatments increased sowing depth by 36.4% compared to Noti.4 and Noti.3 treatments. The highest depth uniformity was observed for Noti.3 and Noti.4 treatments, respectively. The findings revealed that when the press wheel removed from the seeding unit, both the disk and tine opener treatments (Noti.1, Noti.3) had higher speed of emergence as compared to using press wheel treatments (Noti.2, Noti.4). A comparison of mean values wheat yield showed that when press wheel was not used, the Noti.1 and Noti.3 treatments increased crop yield by 11.7% and 14.2% as compared to Noti.2 and Noti.4 treatments, respectively.

Keywords: Direct drilling, Furrow opener, sowing performance, speed emergence, wheat yield

AERI

Technical and Economical Evaluation of Red Pepper Solar Drying in Davarzan

H. Chaji*, P. Sharaie, M. Hedayatizadeh, M. Kaydashti

Email: hchaji53@gmail.com

Location: Research Center for Agriculture and Natural Resources of Khorasan–E-Razavi Province

Abstract

Red pepper is one of the most commonly used spices in foods. The highest amount of red pepper production is in Davarsen in Khorasan Razavi province with a cultivated area of about 700 hectares and an average production of 3 tons of dry crop per hectare. Because of sufficient sunshine in the harvest season, the purpose of this study was to determine the best use of solar drying for drying this product. Therefore, in this study, the following different states were considered and compared: 1) Direct solar Radiation 2) Indirect Solar Radiation 3) Combined Solar Dryer 4) Common Method (Open Sun Drying) 5. Laboratory thin layer drying (industrial method). For each method, the temperature and humidity of the air were measured at the inlet, inter and outlet, dry kinetics, drying time, color change parameters, antioxidant properties and microbial contamination. At the end, the information was analyzed using computer softwares. The results showed that the traditional and industrial methods were the fastest and slowest methods for drying red pepper with 25 and 144 hours, respectively. The use of solar dryers reduced the drying time significantly (by about 50%) compared to the traditional method. Among the fitted models on experimental data, logarithmic model was more suitable in most cases. Contrary to the traditional method, the most commonly used color changes and direct sunlight dryers have the most color variations. The reason for the increase in total color changes in these dryers was the relatively high temperature during the mid-hours of the day when the sun's radiation peaked. The dried specimen in the traditional method had the highest contamination and had the least antioxidant properties among the dried peppers.

Key Words: Drying Kinetics, Microbial Contamination, Quality Parameters, Red Pepper, Technical and Economical Evaluation, Solar Drier

AERI

Evaluation of Energy Consumption in Safflower and Maize Production in East Azerbaijan Province

A. Salek Zamani*, S. Abedi and A. Nasseri
Email: asalekzamani@yahoo.com

Location: Research Center for Agriculture and Natural Resources of East Azerbaijan Agricultural Province

Abstract

The cultivated area of wheat, safflower and corn in East Azarbaijan province is about 437450, 40 and 2323 hectares, and the yield of three products is 3981, 1500 and 45682 kg / ha, respectively. This project was implemented in four cities of Azarshahr, Tabriz, Ajabshir and Malakan. The input energy in wheat is 38487 Mj per hectare and the output energy is 103462 Mj per hectare. The energy efficiency in wheat cultivation is 2.67 and the net energy level is 64782 Mj/ha. The energy efficiency is equal to 0.13 kg per Mj of energy and the specific energy content is equal to 95.7 MJ / kg of wheat. The intensity of energy in wheat cultivation is 3.87 Mj per square meter. The energy input in safflower is 35328 Mj/ha and the output energy is 81813 Mj/ha. The energy efficiency in safflower cultivation is equal to 3.2 and the net increase of energy is 46484 Mj/ha. The energy efficiency is equal to 0.1 kg per Mj of energy and the specific energy is 10.8 Mj per kilogram of safflower. Energy intensity in safflower crops is 3.5 Mj/m². The input energy in corn is 25792 Mj per hectare and the output energy is 57240 Mj per hectare. The energy efficiency of corn cropping is equal to 2.2 and the net increase of energy is 31448 Mj/ha. The energy efficiency is 0.3 kg per Mj of energy and the special energy is 3.6 Mj per kg of corn. The intensity of energy in maize crops is equal to 2.6 Mj/m².

Keyword: Energy, Wheat, Safflower, Corn, East Azarbaijan Province



AERI

Joinder of Proper Tillage Attachments in Front of Row Crop Planter for Jointly Strip Tillage and Planting Operations

H. R. Sadeghnezhad*

Email: hsadeghi1347@yahoo.com

Location: Research Center for Agriculture and Natural Resources of Gorgan Province

Abstract

At no tillage, the coulters are the best way to cross the plant residues, which, along with the furrow openers, prepare soil for seed placement. For this purpose, four tine coulters designs in front of the soybean mechanical planter were installed and tested on the basis of a two factor randomized complete block design using strip plots with four coulters (sweep, nail, narrow chisel and T inverted) as factor A and The three factors related to the speed of tractor (4.8, 7.2 and 9.4 km / h) as factor B were performed. The sweep model had the highest width and depth of soil tillage. T inverted coulters at the specified depth with the least amount of standard deviation got the highest uniformity of seed distribution on the row that was 80.4% and did not change depth of seeding by speed increasing but increased the distance between two seeds. Also, the highest quality of feed index (42.7%) and the lowest multiple index (46.8%) were related to this treatment and its miss index has been around other coulters. Eventually, the nail coulters was able to produce the highest yield of 4469 kg/ha at 7.2 km/h. Although the technical performance ahead of the T inverted is better, the nail coulters is more suitable for simplicity and performance as well as its low cost compared to other tested coulters.

Keywords: Coulters, No Tillage, Seeding Indices, Soybean

AERI

Determination of Appropriate Apple Harvesting Machine

F. Amirshaghghi*, J. Kafashan and Sh.Zomorodi
Email: farid.amirshaghghi@gmail.com

Location: Research Center for Agriculture and Natural Resources of West Azerbaijan Province

Abstract

West Azarbaijan province has 60616 hectares of fertile orchards and the average production of 23 tons per hectare, which is the first place of apples production in Iran. In recent years, horticulture mechanization has become a new strategy for quality production and cost reduction in policy makers' work plans. The main objective of this study was to investigate the present situation from the perspective of harvesting mechanization to determine the appropriate method for harvesting apple trees. To conduct this research, 20 orchards of apple fruit were selected in Balangz and Barandoz areas, which are major areas of apple production in Urmia. Data were collected including orchard area, variety type, distance between trees, ground slope, base type, orchard age, mixing percentage, pruning type, tree apple harvesting technique, harvesting equipment, number of workers and fruit yield per hectare during the season. In analyzing the collected data from the orchards, descriptive statistics including descriptive statistics and classification, graphic representation and calculation of values were used. Data analysis was done by hierarchical model and options included traditional harvesting, semi-mechanized method, fully mechanized method and local design. The selection criteria were based on ease of use, availability, adaptability, and flexibility. The results showed that in the current situation, the "local design" option was the best option using the semi-mechanized method with the highest score of 0.391. The traditional method with a score of 0.304, semi-mechanized method with a score of 0.293, and fully mechanized method with 0.012 in the next ranked. The fully mechanized method was using foreign equipment, which was not compatible with the West Azarbaijan regarding the specifications and conditions of the orchards, unless the orchard was mechanized from the beginning. These results, as the first field-based model, can be considered as the basis for a local design of apple harvesting machine and the basis for comprehensive research on the mechanization of orchards and trees in the long run for the growth and prosperity of this country's product range.

Keywords: Apple orchard, Harvesting Machine, Methods and Mechanisms

AERI

Effect of Planter Type and Seed Variety on Seedling Emergence Uniformity and Irrigated Seed Cotton Yield in Fars Province

M. Roozbeh*, L. Jokar, M. H. Hekmat
Email: Email: roozbeh.majid@gmail.com

Location: Research Center for Agriculture and Natural Resources of Fars Province

Abstract

The establishment of an acceptable population of cotton seedlings is important to obtain high yields. A field experiment was conducted to evaluate the effect of planter type and seed variety on cotton seedling emergence uniformity and irrigated seed cotton yield. The experimental design was a randomized complete block with split-plot arranged in three replications. The seed varieties were in five levels of T2 (V1), Karisma (V2), Lidiya (3), Edisa (V4), B440 (V5) as the main plot and four cotton planter type as the subplot include: grain drill with knife opener and conical press wheel (P1), cultivation combination with cultivator (seed drill) with single disk opener and bar covering device (P2), row crop planter with runner opener and rubber smooth-crown press wheel (P3) and direct drill with double disk opener and double rubber band press wheel (P4). The results showed that variety and planter type had a significant effect on sowing depth, speed of emergence, plant distance, boll number and seed cotton yield. The P2 treatment compared to P1, P3, and P4, caused sowing depth increasing by 39.5%, and emergence speed reduction by 52.1%. The maximum and the minimum number of boll was observed for V3 × P3 and V4 × P2 treatments, respectively. The results revealed that the V3 × P2, V3 × P1, and V3 × P4 interactions reduced seed cotton yield by 24.8, 15.9, and 14.7% compared to V3 × P3 treatment, respectively. The results of factor analysis indicated that sowing depth, plant distance, and boll number were identified as the most effective indicators for sowing performance and cotton morphological indexes.

Keywords: Cotton, Emergence speed, Variety, Cotton Planter, Sowing depth

AERI

Technical and Agronomic Comparison of Transplanting (Mechanical Transplanter) and Seed Drilling of Cotton under Different Tillage Methods

M. Roozbeh*, S. E. Dehghaniyan, A. Shirvanian, M. Zahiri

Email: Email: roozbeh.majid@gmail.com

Location: Research Center for Agriculture and Natural Resources of Fars Province

Abstract

A field experiment was conducted to evaluate the technical and agronomic aspects of transplanting and direct seeding of cotton under different tillage systems. The experimental design was a randomized complete block with split-plot arranged in three replications. The planting systems were in two levels of mechanical transplanting (Transp.) and direct seeding (Dir.S) as the main plot and four tillage methods as the subplot include: chisel packer+ disk (Til.1), chisel packer+ power harrow (Til.2), stubble cultivator+ disk (Til.3) and moldboard plow+ disk (Til.4). The results showed that planting and different tillage systems had a significant effect on effective field capacity, field efficiency, loosed seedling index, transplanting efficiency, water consumption, seed cotton yield and water use efficiency. The minimum effective field capacity and field efficiency was observed for the Transp. treatment. The findings revealed that the maximum and minimum loosed seedling index was observed for Til.4 and Til.1 treatments, respectively. The results also showed that the Til.1 treatment on average increased transplanting efficiency by 24.2% compared to Til.4 treatment. The Transp. × Til.1 interaction reduced water consumption by 19.7% compared to Dir.S × Til.4 treatment. The maximum seed cotton yield and water use efficiency was observed for the Transp. × Til.1 and Transp. × Til.3 interactions.

Keywords: Cotton, Tillage, Seed Cotton Yield, Transplanting, Water Use Efficiency

AERI

Evaluation the Influence of Conservation Tillage Methods on Severity of the Dominant Soil-Borne Diseases and Potato Yield

Z. Omidmehr*, F. Ommati*, A. Mohammadi, A. Paydar, S.H. Hosseini, A. Berenji, and M. Rahati

Abstract

Conventional tillage with moldboard plows causes soil to be exposed to erosion. Although soil erosion can be reduced by using conservation tillage, but its fears that conservation, methods have a negative effect on plant yield and plant diseases. In order to study the effect of conservation tillage methods on severity of the dominant soil-borne diseases and potato yield, this study conducted for 4 years (2015-2018), at Semnan (Shahrood) Agricultural Research and Education Center in silt-sandy soil. A strip-block experimental design at Randomize Complete Block Design (RCBD), according to region's rotation (potato-wheat), with 3 replications was used, that horizontal factor included tillage methods (1-Conventional method (Moldboard plowing), 2-Reduced tillage with Chisel plough, 3- Disk plowing and 4- Reduced tillage with Chisel-packer) and vertical factor included two treatments, collecting and retaining plant residues. Tillage operations for potato and wheat planting performed at April and October, respectively. Depth of plowing, in moldboard and disk ploughs was 20 centimeters, and in reduced tillage was 20-25 centimeters. Some parameters, same as potato yield, tuber size, and potato fusarium wilt, potato scab disease, wheat yield and its components, fuel consumption, operation time and field capacity were measured. The results of combination analysis of data showed that the effect of soil tillage methods on potato yield was not significant. In the first year of experiment (2014), the highest amount of potato yield related to the conventional method, but in the third year of experiment (2017), the potato yield in reduced tillage was 30% higher than conventional method. However, the difference between treatments was not significant for potato yield. In addition, in different years, the effect of tillage operation on wheat yield was not significant. Effect of soil tillage methods on soil borne diseases yield was variable different years. So that in the common method, potato fusarium wilt decreased, but the rate of dry rot and potato scab disease was lower in reduced tillage methods. Therefore, conservation methods (plowing with Chisel plough and Chisel-packer) in compared with conventional methods, not only; there was no negative effect on crop yield and soil borne diseases of potato, but also reduced farm traffic, operating time and fuel consumption. The test results also confirm this fact. Therefore, in potato production with respect to crop rotation, reduced tillage can be a good alternative to the conventional method.

Keywords: Chisel plough, Chisel packer, Crop yield, Potato, Plant diseases

AERI

Comparison and Evaluation of Mechanized, Semi-Mechanized and Traditional Picking Safflower Petals

M. Safari*, H.sharifnasab.A.R,Mohajer.A.H,Omidi. A,Ayvani and A,Younesi

Email: Email: email2safari@yahoo.com

Location: Agricultural Engineering Research Institute Headquarter, Alborz Province

Abstract

The safflower petals, due to its properties and too many applications, have a good buying market. Petals are used in the food industry as natural food, in the textile and carpet weaving industry for the coloring of wool and other textiles. The petals also are used in painting industries in order to produce color. In many parts of Iran, this crop is harvested by hand method with plenty of cost and high labor costs. In this study, three methods of handy (conventional), Knapsack (Indian modified) and electric engine were compared, in terms of farm capacity, loss percentage, purity percentage, energy consumption and costs after the modifying of the Indian collecting machine. The design format was a randomized complete block design with three replications.

The results showed that there was a significant difference between the experimental treatments in the 5% level. In terms of the means comparison, harvesting loss (in the wet condition) of three methods of harvesting included Knapsack, feminine and traditional methods were 0.63, 1.11 and 3.25% respectively. The percentage of purity was 97.71%, 98.66%, and 95.29%, respectively. There was not a significant difference between these methods (loss and purity), but between mechanical and handy methods, the difference was magnificent in level 5%. The field capacity of the methods was 2.45, 2.76 and 2.42 g / min (in dry condition), which was not significantly different between the treatments in 5% level. The energy consumption for electric engine method was significant compared to the other two methods. In terms of the economic point, using the profit-to-cost ratio, this ratio was 1.75, 1.55, and 1.16 respectively for Knapsack, electric engine and handy methods, respectively; that Knapsack method was superior to other methods, If It used solar panel in Knapsack method, the benefit –cost ratio will decrease to 1.54 that this method has economic justify.

Keywords: Harvesting, Mechanized harvesting, Petal, Safflower

AERI

Attaching of Seed Drill with Heavy Disc Harrow and Farm Evaluating for Wheat Cultivation

J. Habibi Asl, A. Azizi, and Vahid Yaghoobi

Email: Email: jhabibi139@yahoo.com

Location: Research Center for Agriculture and Natural Resources of Khuzestan Province

Abstract

Seedbed preparation with minimum energy, soil conservation, yield improvement, and cost reduction are the targets of sustainable agriculture. Development of combined machines can prepare these targets. In this research a combined seed-fertilizer planter fabricated with could till soil with heavy disk. Seed-fertilizer planter section included of a grain drill with 2.3 widths and tillage section included of an offset disk. These sections were connected with a designed metallic connector. Then this combined machine was evaluated in field condition. This project was implemented in basis of randomized complete block in split plot design and 3 replications. Main plots were four tillage-planting methods included of: designed combine machine (T1), no tillage with direct drill (T2), two pass disk following with grain drill (T3), chisel packer following with grain drill (T4). Subplots were seed rates at three levels included of: 150, 175 and 200 kg/ha. All treatments were applied in the same condition in a field covered by previous crop residue. The technical indices included of fuel consumption, operation time, field capacity and agronomy indices included of grain yield and its components were measured and evaluated. The results show that treatments were significantly different from view point of technical indices however they were not significantly different from view point of agronomy indices except Percentage of Emergence Percentage of Emergence. The highest and lowest rates of fuel consumption assigned to T4 and T1 with 38.4 and 14.5 l/ha, respectively. Also T1 treatment followed by T2 treatment had the second grade in field capacity with 1.66 ha/h rate. The combined machine could save in operation time and fuel consumption related to T4 with 17.6% and 62.2% rates, respectively. The results of evaluation of seed rates showed that seed rates upper than 150 kg/ha didn't have significant difference from view point of agronomy indices except to spike numbers per m². Therefore 150 kg/ha is recommended for wheat planting because saving in seed consumption. According to these results, this combined machine (fertilizer -seeder equipped with heavy disk harrow) is suitable for conservation tillage and seeding of wheat.

Keywords: Combined machine, Heavy disk, Seed drill, Wheat

AERI

Measurement of Combine Harvesting Losses of Wheat in Iran to Introduce their Reduction Solutions

E. Dehghan*, A. Eivani*, A. Hedayatipour*, A. Asadi* , G. Taghinejad*, H. Chaji*, H. Sadeghenejhad*, Z. Omidmehr*, S. Zarifneshat*, S. Abbasi*, S. M. Afzali*, A. Vahedi*, A. Mahdinia*, K. Gerami*, M. Shakir*, M. H. Saeedirad*, M. R. Mostofisarkari*, M. A. Rostami*, M. Safari*, M. Zabolostani*, H. Sharifnasab*, M. Bahrani, H. Gazor, A. Bahador, M. H. Razaghi, M. Mokhtari, P. Zargaripour, E. Khatib Shahidi, O. Taki, M. Tavakoli, M. Keidashti, R. Ebrahimi, M. Emami, A. Dibaji, S. M. Alavimanesh, M. R. Ahmadi Afzadi, H. R. Sadeghnejhad, N. Abbyar, A. Younesi, H. Serajeh, A. Shahsavari, S. Goodarzvand Chegini and F. Ahangari

Email: Email: Email: elyas_dehghan@yahoo.com

Location: East Azarbaijan, West Azarbaijan, Ardebil, Isfahan, Alborz, Tehran, North Khorasan, Razavi Khorasan, South Khorasan, Khuzestan, Zanjan, Semnan, Fars, Qazvin, Qom, Kerman, Golestan, Gilan, Mazandaran, Central and Hamedan pavinces

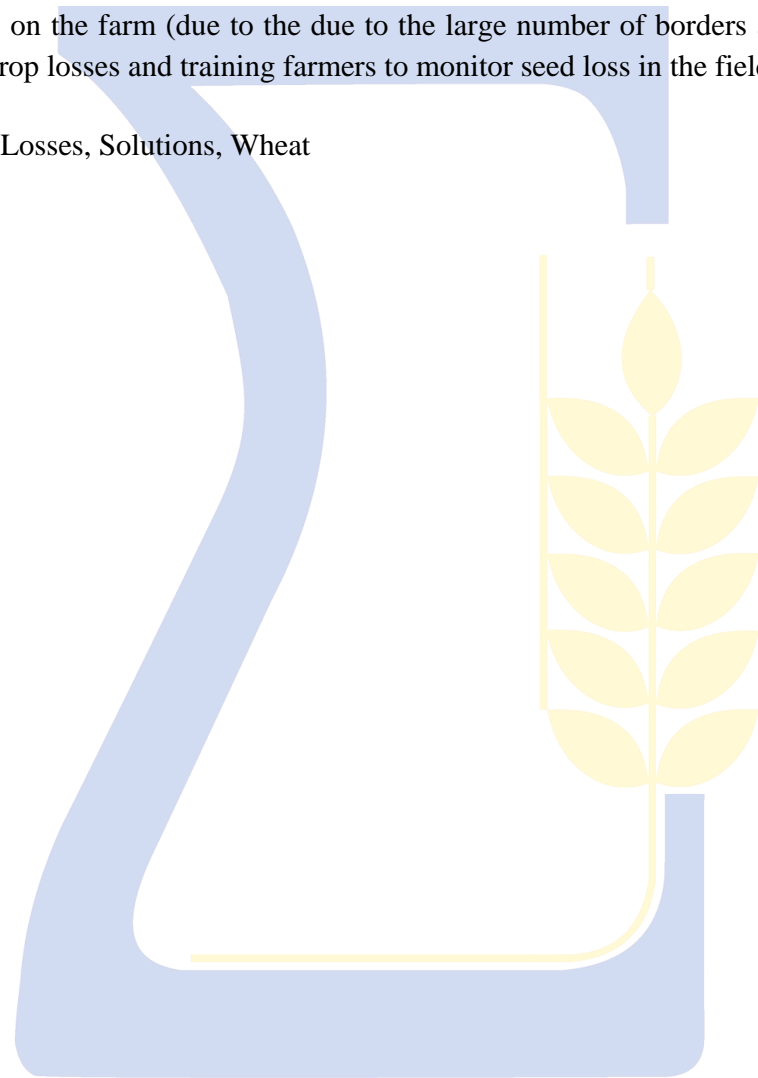
Abstract

The strategic position of wheat and the role of protecting agricultural inputs (especially water resources) in food and social security of the country on the one hand, and on the other hand, the expansion of adverse effects of climate change in the country and the severe wind and rain in the growing season of wheat, increase the need for monitoring grain losses and planning to reduce it in the country. The national research project conducted in the year 97-96 in order to determine the type and source of grain losses and the contribution of each human, technical and crop factors affecting the amount of wheat grain losses in harvesting with new and common types of John Deere, New Holland and class combines, in the country. The research was carried out with the participation of the Agriculture Directorate (wheat plan office and Agricultural Mechanization Development Center) in 21 provinces of the country. The number of studied combines was 536, which were randomly selected and visited and sampled while working on farmer's fields. In addition, crop and farm conditions, including cultivated wheat cultivar, Field area and soil tillage-planting method were recorded in special forms. Also, farmers, experts and drivers of combines were interviewed face to face and completed questionnaires. Sampling of combines was used to determine the percentage of seed loss in the platform and processing unit (back combine) and sampling from a combine tank to determine grain moisture content and impurities in harvested grains. Sampling was done at unharvest areas for determining the grain yield and percentage of natural loss. Type, age, forward speed, and field capacity of combines were also measured. The results of this study showed that the average total loss of wheat harvest stage was 3.75% in the country, of which 1.26% was natural loss and 2.49% was combine losses. The sum of combine and natural losses in rainfed and irrigated wheat fields was 3.34% and 4.40%, respectively. The mean loss in rainfed and irrigated wheat fields was 2.86% and 2.30%, respectively. The average natural loss in irrigated and rainfed wheat was estimated to be 1.04 and 1.54% respectively. In the year of this research, the amount of natural losses of grain in Tehran province due to exceptional circumstances and lodging wheat in the farms due to heavy wind and rain was 27.1%, but the combine losses in this province was 2.88%. The results of this study showed that the

wheat grain loss by combines in the country dropped by 0.88% over the past 13 years to reach 2.49%. According to available data of wheat grains harvested in 2018, the calculations in this study showed that the total wheat produced in the country's irrigated and rainfed fields was 13824481 tons, of which 13300000 tons were harvested and the remainder 519864 tons was lost at the harvesting stage (277219 tons of irrigated wheat and 242645 tons of rainfed wheat), of which 338999 tons (65%) were lost by combine and 180864 tons (35%), due to natural loss. If the price per kilogram of wheat (17000 Rials) is estimated at 0.142 USD, the total damage to farmers and the country due to the total loss of wheat grain is about 74 million USD, which is estimated to be about 48 and 26 million USD, due to grain loss by combine and natural loss respectively. Also, assuming an average production of 4280kg ha⁻¹ and water consumption of 5800 cubic meters per hectare for irrigated wheat, the amount of wasted water for producing grain lost in irrigated and rainfed fields and total of grain losses are equal to 376, 329 and 705 million cubic meters of water (1.8, 1.6 and 3.4 times more than the Amir Kabir dam reservoir of Karaj) respectively. Other results of this study showed that with each percentage reduction in wheat losses, farmers' income in irrigated and rainfed fields would increase by 5.9 and 2.3 USD per hectare, respectively. Grain losses was 2.9%, 2% and 1.8%, respectively, by common types of John Deere (955, 1050 and 1165), class (Tucano 320, S80 and Medion 310) and New Holland (5060, 5070 and 5080). The use of New Holland and class combines with John Deere combines (955, 1055 and 1165) increased the farmers' income in irrigated wheat field, due to the reduction in grain loss, by 3.8, 7.1 and 6.9 USD per hectare. Also, seed loss in fields with a yield of less than 4 tons per hectare, 3% and in farms with a yield of more than 8 tons per hectare, was 1.6%. The data of this study showed that for farms with an area of less than 10 hectares, there is not a strong correlation between the amount of combine losses and the field area, but with an increase in the area of the farm to more than 10 hectares, the average drop in combines dropped by 0.7%. Of the combine losses in wheat grain in the country (2.49%), 74% of it was created by the platform and 26% by the processing units (back combine). His finding highlights the importance of monitoring the performance of the combin's platform to reduce combine losses in the country. Average of grain moisture content at harvest time was 9.7% and 10.1%, respectively, which was less than optimum moisture content (12 to 14 percent). The loss caused by native and migratory combines was estimated to be 2.72 and 2.36 percent, respectively. The average age of the combines in the country was 14 years and For each year of the increase in the age of the combine, the amount of combine loss increased by 0.26%. In general, to compare zones and determine critical points in crop losses, the percent of grain loss and the amount of grain lost per hectare alone is not sufficient and attention to the total amount of grain lost is more important. At the moment, with the increase in the use of advanced combines, the acceptable wheat grain combine loss in the world is between 1% and 2%, and its reduction below 1% is targeted. In the past decade, the expansion and modernization of the agricultural machinery (especially harvesting machines) has been paying great attention in the country. To reduce wheat losses by combines to an acceptable range of 1% to 2% and to achieve ideal conditions (less than 1%), it requires planting of wheat varieties resistant to seed falling, use of advanced combines, timely delivery and sufficient combines, timely harvesting of wheat, use of modern technologies and monitoring systems and automatic control of grain losses in designing and manufacturing domestic combines,

basic leveling and reducing roughness on the farm (due to the due to the large number of borders and irrigation streams), Combine driver training for detecting and controlling crop losses and training farmers to monitor seed loss in the field.

Keywords: Combine Harvester, Grain Losses, Solutions, Wheat



AERI

The Spread Pattern of Injected Liquid into the Soil as Affected by Soil Aeration

O. Taki*, A. Asadi, M. Miranzadeh, A.A Shahabi and M. Tavakoli

Email: orangtaki@yahoo.com

Location: Research Center for Agriculture and Natural Resources of Esfahan Province

Abstract

Compressed air is injected to the soil either to reduce the soil compaction exclusively (aeration) or to complement the liquid injection around the trees. In latter case aeration aims to create some fractures in the soil in order to achieve a better diffusion of liquid under the soil. This study was focused on diffusion pattern of the liquid injected directly or after aeration under the soil in both dry and wet soil. The comparison was conducted in an split plot design based on complete randomized blocks where the soil moisture content in 2 levels were applied in main plots and the injection methods in sub plots. The moisture treatments were in the range of 5% to 6% as dry soil and 16% to 17% as wet soil. The injection device consists of two separate systems for providing compressed air and pressurized liquid and an injecting portable probe which is connected to the systems by hoses. To apply treatments the probe was inserted into the soil to a depth of 50 cm by a pneumatic hammer mounted over the probe. To apply treatments associated with aeration, the compressed air (under 16 bar pressure) was primarily injected for 3 seconds followed by injecting liquid for a certain time, whereas for direct liquid injection no air was applied into the soil. The applied liquid was made of water and mineral dyes to contrast the soil color. In order to assess the liquid horizontal diffusion, three days after injection, the soil was excavated by hand tools in the vicinity of insertion point in a radius of 1m to a depth of 50 cm and the periphery of the zone traced with dyed particles was marked in the horizontal plane. The area of the obtained shape then was calculated and considered as an index for horizontal diffusion rate. The results showed that diffusion rate in wet soil was significantly higher than dry soil but aeration before liquid injection had no significant effect on the liquid diffusion rate. In wet soil, applying the air pressure upheaves the soil layer above the injection point and by cutting the pressure the soil subsides on its original point. Then the injected liquid flows horizontally into the fractures developed below the upheaved layer. In the case of direct injection (no aeration) in the wet soil, the liquid pressure itself is still adequate to upheave the top layer and the liquid flows horizontally below the top layer. In dry soil, on the contrary, due to high shear strength of the soil, no upheaving occurs in both injection treatments. So, the injected liquid accumulates in close vicinity of injection point or flows through the shrinkage cracks that are extended to the soil surface. Soil aeration before liquid injection not only has no significant effect on its diffusion rate, increases the operation time to 4 time of direct liquid injection in dry soil and to double in wet soil.

Keywords: Aeration, Injection of Solution in the Soil, Liquid Fertilizer

AERI

Application of in-furrow Seed Drill in Mechanized Wheat Cultivation to Increase Water Use Efficiency in Saline Soil Conditions

A. Reshadsedghi*, A. Mohammadi Arasi, R. Nikanfar, H. Mohammadi Mazraeh, A. Molaee
Location: Research Center for Agriculture and Natural Resources of East Azarbaijan Province

Abstract

Water scarcity in the agricultural sector has consequences such as increasing soil and water salinity, increasing pests and plant diseases, and consequently decreasing soil fertility, reducing crops, livestock and horticulture, all of which provide basis of reduce income and increase poverty and migration of farmers. Use of management strategies to increase water use efficiency index in agricultural fields is one of the practical options to combat dehydration. Saline soils and waters are among the resources that can be utilized with proper management and thorough knowledge of the problem. The aim of this study was introducing the wheat seed sowing method into furrows with 60 cm width by an in-furrow seed drill and furrow irrigation as a suitable alternative to conventional cropping method (manual seed broadcasting and flood irrigation) in saline soils of marginal of Urmia lake. To perform the experiment, both cultivation and irrigation methods were applied in two plots with saline soil. In each plot, crop yield components, grain yield, irrigating water consumption, water use efficiency and soil salinity distribution were measured after crop harvesting. Results showed that the method of seed planting into irrigation furrow by an in-furrow seed drill and furrow irrigation in saline soils instead of seed broadcasting and flood irrigation, did not have more effect on yield increase but it greatly reduced water consumption and consequently increased water use efficiency about 33%. So, due to the scarcity of agricultural water in the region and excessive water consumption in the flood irrigation method, wheat cultivation by an in-furrow seed drill and furrow irrigation is recommended especially in saline soils.

Keywords: Flood irrigation, Furrow irrigation, Irrigated wheat cultivation, Salinity

AERI

Technical and Agronomical Evaluation of Tarashkadeh Co. Raised Bed Seeder Machine for Wheat Seeding

E. Dehghan, M. M. Nakhjavani Moghadam, A. Eyvani and A. Yonesi

Email: Email: elyas_dehghan@yahoo.com

Location: Agricultural Engineering Research Institute Headquarter, Alborz Province

Abstract

Wheat cultivation on raised bed is one of the new seeding methods that is being promoted in the country by the Ministry of Agriculture-Jihad. Recently, Trashkadeh Co. has developed a new machine for raised bed seeding. This study was conducted to evaluate the performance of this machine under field conditions in a split plot in a randomized complete block design with three replications for one year in Alborz province. The cultivated wheat cultivar was Sivand. The main plots were seed rate at three levels of 100, 130 and 160 kg/ha. The main plots also included three-level of planting method, raised bed seeder Equipped with underground fertilizer unit (M1), raised bed seeder Equipped with soil fertilizer disposal unit (M2) and conventional cereal seeder (M3). The results showed that there was no significant difference among M1-M3 in terms of field capacity and time required for seed sowing operations, but the uniformity of planting depth in M1 and M2 were 94.5% in M3 was 75.6%. Percent of seed germination in M1 and M3 were 90% and 72%, respectively. Although there were no significant differences among M1-M3 for yield. The highest seed yield (5571 kg ha⁻¹) was obtained from seed rate of 160 kg/ha by M1. There was a significant difference between all levels of seed rate in terms of grain yield and the highest grain yield (5375 kg/ha) was obtained from 160 kg/ha. Removing the furrow opener of the fertilizer units in M2 had no negative effect on grain yield. Therefore, the cost of producing seed bed planter machine can be reduced by removing the components involved in soil in the fertilizer units and making other components of the fertilizer unit cheaper. Wheat raised bed Planting with M1 or M2 instead of M3 (check), in addition to reducing water consumption by 5% and increasing water productivity by 1.8%, increased farmers' income by increasing grain and straw yields by 617100 and 362471 tomans per hectare, respectively and reduced the cost of irrigation water use to 485230 tomans per hectare. In general, for wheat cultivation in non-saline soils, the use raised bed seeder of Tarshkadeh Co. due to increased net income per unit area, greater uniformity in planting depth, increased seed emergence percentage and reduced irrigation water use (especially in poorly leveled lands), is suggested.

Keywords: Drill Seeder, Raised Bed, Seeding, Wheat

AERI



Agricultural Engineering Research Institute (AERI)

Postal Address: P. O. Box 31585-845, Karaj, Iran