

**COMPREHESIVE SEMESTRAL REPORT AT PHILIPPINE CENTER FOR
POSTHARVEST DEVELOPMENT AND MECHANIZATION
(PHILMECH)**

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An Undergraduate Field Practice Report Submitted to the Faculty of the Department
of Agricultural and Biosystems Engineering, College of Engineering,
Central Luzon State University, Science City of Muñoz,
Nueva Ecija, Philippines in Partial Fulfillment
of the Requirements for the
Degree of

**BACHELOR OF SCIENCE IN AGRICULTURAL ENGINEERING
(Agricultural Power, Energy and Machinery Engineering)**

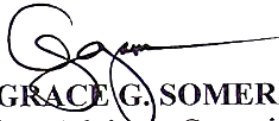
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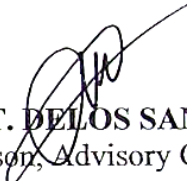
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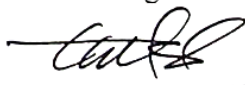

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BIOGRAPHICAL SKETCH

Melissa U. Fabros is the youngest daughter among the four children of Mr. Dominador D. Fabros and Mrs. Lucila U. Fabros. She was born on December 18, 1997 in San Mateo, Isabela.

She started schooling when she was 5 years old at Salinungan East Day Care Center and graduated as 2nd honorable mention. She continued her primary education in 2003 and finished at Salinungan East Elementary School as 3rd honorable mention in 2009.

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ABSTRACT

FABROS, MELISSA U., Department of Agricultural and Biosystems Engineering, College of Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, **June 2019. COMPREHENSIVE SEMESTRAL REPORT AT PHILIPPINE CENTER FOR POSTHARVEST DEVELOPMENT AND MECHANIZATION (PHILMECH)**

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The two-month field practice at Socio-Economic and Policy Research Division at Philippine Center for Postharvest Development and Mechanization, provided a comprehensive training especially in the performance evaluation of modified row-onion mechanical seeder that is adapted for soybean production. The study focused on determining the delivery rate of seeder and germination rate of soybean seeds under laboratory and field testing, and performed cost analysis of machine that supporting the Department of Agriculture in minimizing the import dependence of soybean and initiated the development of soybean industry in the Philippines cause of its high demand.

Laboratory delivery rate of seeder was gathered from the use of hopper capacity (1, ½, ¼, 1/8) and revolutionary speed (3, 3.5 and 4 kph) that laid out in Complete Randomized Design. Soybean seed germination rate under laboratory condition was determined from the collected normal seedlings emerged in sand substrata method. Seeder field performance parameters (effective field capacity, theoretical field capacity, field efficiency, delivery rate, fuel consumption) was determined from gathered data of consumed seeds, total operating time, speed and area planted. Soybean seedling survival rate under field condition was gathered from the collected seedlings in a 2m² sample

frames and the cost analysis of mechanical seeder was determined from 30 days of planting/year, 2.22 ha/day and 6 hrs of effective operating time.

Highest delivery rate of mechanical seeder gathered in laboratory test was the combination of full hopper capacity and 3 kph operational speed and soybean seed was resulted with a germination rate of 81%. Field performance of seeder was resulted to an effective field capacity of 0.37%, theoretical field capacity of 0.48%, field efficiency of 77% seeding rate of 81.8% and fuel consumption of 0.56 L/hr with an average soybean plant population of 77.30 seedlings/frame and seedling survival rate of 59.18%. Mechanical seeder has a breakeven point of 21.17 ha/yr, payback period 1.57 years and annual net income of P80,880.50.

Keywords:

Mechanical Seeder; Soybean; Performance; and Evaluation

LITERATURE CITED

- AL-HAMED S.A., M.F. WAHBY, A.M. ABOUKARIMA, and I.S. TABASH. 2015. Evaluating a laboratory test-rig for calibration of a grain drill for educational purpose, Vol. 10, No. 12.
- BROESKE M., A.P. GASPAR, J.M. GASKA, and S.P. CONLY. 2016. Soybean growth stages. UWCoolbean_Soybeangrowthstages_2016.pdf.
- BUCKLEY J., and H.C. PETERSON. 2011. Preliminary cost benefit analysis for urban agriculture – An introduction. pp 5-6
- CASTEEL S. N. 2012. Estimating soybean yields – simplified.
- DELA CRUZ R. SM., D. R. MIRANDA, R. G. IDAGO, and SOCIO-ECONOMIC AND POLICY RESEARCH DIVISION. 2017. Technology Leaflet, PhilMech 10-Row Onion Mechanical Seeder.
- GAZZONI D. L. 1994. Botany. In: Tropical soybean: improvement and production. Food and Agricultural Organization of the United Nations, Rome, pp 1–12.
- GUNAVANT, P. S., S. J. MULANI, V. N. GANDHE, G. SHINDE, and V. D. YADAV. 2017. Farm Mechanization by using Seed Planting Machine, Volume 1, January 2017.
- GRIEPENTROG, H.P., 1998. Seed distribution over the area. EurAgEng. 98-A-059, Oslo.
- HALDERSON, J. L. 1983. Planter selection accuracy for edible beans. Trans ASAE, 26, (2): 367–371.
- HYMOWITZ T. 2004. Speciation and cytogenetic. In: Boerma HR, Specht JE (eds) Soybeans: improvement production, and uses. Agronomy monographs, 3rd edn. No. 16, ASA-CSSASSA, Madison, pp 97–136.
- HOEFT R.G., E.D. NATZIGER, R.R. JOHNSON, and S.A. ALDRICH. 2000. Modern corn and soybean production. First edition. MCSP Publications.
- KNOX S. 2019. Soybean seed germination concern. Nebraska Crop Improvement Association.
- MURRAY J. R., J. N. TULLBERG, and B. B. BASNET. 2006. Planters and their Components; Section 1; School of Agronomy and Horticulture, University of Queensland, Australia, Australian Centre for International Agricultural

Research.

- NORRIS C. P. 1982. Performance of some different types of peanut/maize planters in NQ. Proc. Conf. on Agric. Eng., Armidale. I.E. Aust. Nat. Conf. Publ. No 82/8: 149–154.
- PAES 122:2001 - Seeder and Planter - Methods of Test
- PAES 122:2001 - Seeder and Planter – Specification
- PANNING J.W., M.F. KOCHER, J.A. SMITH, and S.D. KACHMAN, 2000. Laboratory and field testing of seed spacing uniformity for sugarbeet planters, Vol. 16(1): 7-13
- PROBST A. H., and R. W. JUDD. 1973. Origin, US history and development, and world distribution. In: Caldwell BE (ed) Soybean: improvement, production, and uses. Agron monograph 16. Is ted. ASA, CSSA, and SSSA, Madison, pp 1–15
- STOWE K. D., and J. DHUMPY, 2017. The soybean plant. North Carolina State University, North Carolina A&T State University and N.C. Cooperative Extension
- UNDAN R. C., et.al. 2004. Technoguides for agricultural production and livelihood projects pp 151-156.
- ZULIN, Z., S. K. UPADHYAYA, S. SHAFII, and R. E. GARRETT. 1991. A hydropneumatic seeder for primed seeds. Trans. ASAE. 34(1): 21–26. Am Soc. Agr. Eng. St Joseph, MI.