ENHANCING THE PRODUCTIVITY OF LIMA BEAN (*Phaseolus lunatus* L.) CULTIVARS USING NPK FERTILIZER RATES AND TRAINING IN THE NIGERIAN SAVANNA

BY

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(P17AGAG8004)

DEPARTMENT OF AGRONOMY,
FACULTY OF AGRICULTURE,
AHMADU BELLO UNIVERSITY, ZARIA

MARCH, 2021

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A DISSERTATION SUBMITTED TO THE DEPARTMENT OF AGRONOMY IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN AGRONOMY

DEPARTMENT OF AGRONOMY,
FACULTY OF AGRICULTURE,
AHMADU BELLO UNIVERSITY, ZARIA

MARCH, 2021

DECLARATION

I hereby declare that the work in this dissertation titled "Enhancing the Productivity of Lima Bean (*Phaseolus lunatus* L.) Cultivars Using NPK Fertilizer Rates and Training in the Nigerian Savanna" was performed by me in the Department of Agronomy, under the supervision of Prof. J.A.Y Shebayan and Dr. U. Ibrahim. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this dissertation was previously presented for another degree or diploma at this or any other institution.

....

NASIDI, Yusuf Ahmad Date

Student

The above declaration is confirmed by

....

Prof. J.A.Y. Shebayan Date

Chairman, Supervisory

Committee

CERTIFICATION

This dissertation entitled "Enhancing the Productivity of Lima Bean (*Phaseolus lunatus* L.) Cultivars Using NPK Fertilizer Rates and Training in the Nigerian Savanna" by Nasidi, Yusuf Ahmad meets the regulation governing the award of the degree of Master of Science in Agronomy in the Department of Agronomy, Faculty of Agriculture of Ahmadu Bello University, Zaria and is approved for its contribution to scientific knowledge and literary presentation.

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DEDICATION

This work is dedicated to God Almighty for the innumerable blessings meted me and for a fruitful completion of this work. It is also dedicated to my parents, siblings, my children and to my lovely wife Hauwa`u, for their support and encouragement.

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ABSTRACT

Field trials were conducted during 2018 wet season at the research farms of Institute for Agricultural Research Samaru, Ahmadu Bello University Zaria and National Horticultural Research Institute (NIHORT), Bagauda Sub-Station Kano. The treatments consisted of two cultivars of lima bean (Ex-Manchok Brown, Ex-Manchok Cream), training (trained and non-trained) and four level of NPK 15:15:15 fertilizer rates (control, 150 kg ha^{-1}, 300 kg ha^{-1} and 450 kg ha^{-1}). The treatments were laid out in a randomized complete block design (RCBD) replicated three times; data was collected on crop establishment, growth, yield and yield component. Data was subjected to statistical analysis using SAS statistical package. Differences between means were compared using Duncans multiple range test. Correlation, regression and gross margin analyses were done to determine the strength of the association between factors, determine optimum level of inputs as well as profit margins. The result of the study revealed that, among cultivars used, at Bagauda, Ex-Manchok Brown gave significantly higher LAI and CGR than Ex-Manchok Cream, while at Samaru Ex-Manchok Cream out-yielded Ex-Manchok Brown in pod length, number of grains per pod, 100-grain weight and grain yield per hectare. At both Bagauda and Samaru trained lima bean resulted in significantly higher crop vigour score, LAI, vine length, number of branches and harvest index, 100-grain weight and grain yield per hectare than non-trained. NPK Application of 450 kg ha^{-1} gave the highest with grain yield at Samaru (1944.4 kg ha^{-1}) and Bagauda (237 kg ha^{-1}). Positive and significant correlation was observed between grain yield and crop vigor and 100-grai weight at Samaru but at Bagauda the correlation was highly significant with all crop growth and yield components. When grain yield was regressed against fertilizer levels, the response was linear at both locations. All lima bean production options were profitable at Samaru with trained Ex-Manchok Cream without fertilizer

being most profitable (₦476, 858.4/ha) with net return of ₦ 2.84 per naira invested. At Bagauda all production options were unprofitable due to low crop yields (105 - 237 kg ha^{-1}): fertilizer and its application costs which accounted for 13.4 to 28.9% of total production cost in trained crop and 19.8 to 38.7% in non-trained. From this study it can be concluded that profitable and sustainable lima bean production in northern Guinea savanna, requires training of Ex-Manchok Cream cultivar and application of 450 kg ha^{-1} of NPK 15:15:15 compound fertilizer.