



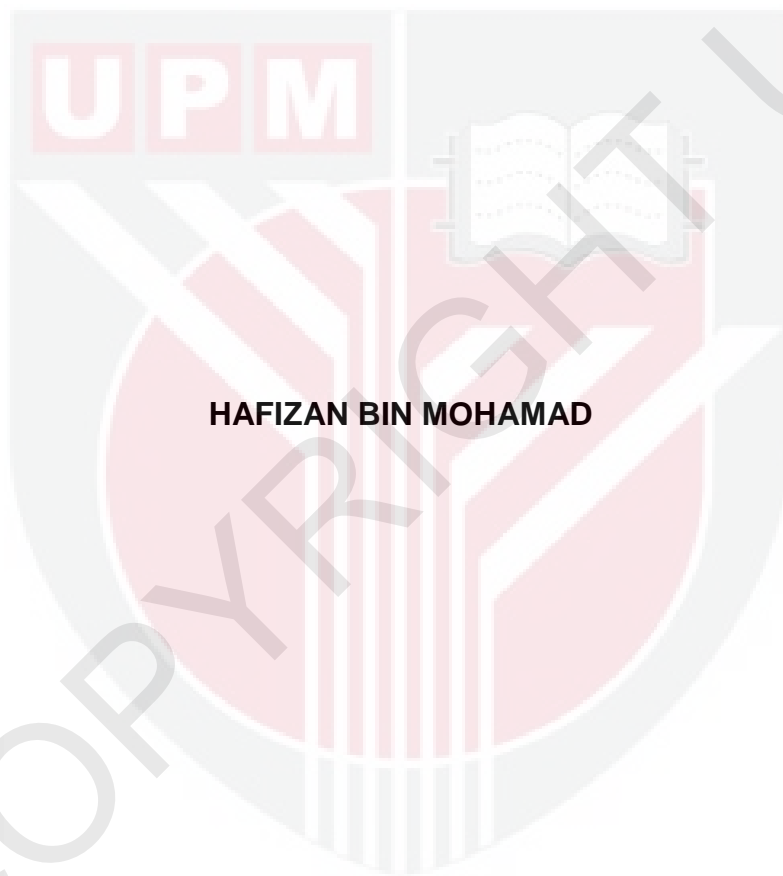
UNIVERSITI PUTRA MALAYSIA

**INTERCROPPING SWEET CORN WITH TWO TYPES OF NAPIER
GRASS AND LEGUMES TO ENHANCE YIELD AND NUTRITIVE
QUALITY OF FORAGE MIXTURES**

HAFIZAN MOHAMAD

FP 2017 104

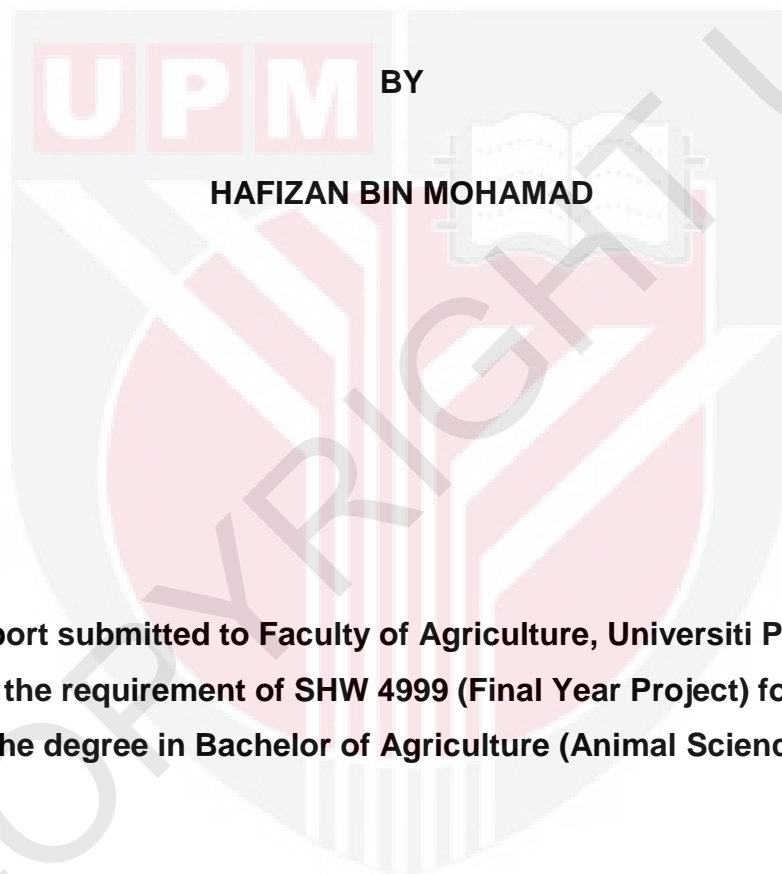
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**FACULTY OF AGRICULTURE
UNIVERSITI PUTRA MALAYSIA
SERDANG, SELANGOR DARUL EHSAN
2016/2017**

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MIXTURES**



BY

HAFIZAN BIN MOHAMAD

**A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia,
in fulfillment the requirement of SHW 4999 (Final Year Project) for the award of
the degree in Bachelor of Agriculture (Animal Science)**

**FACULTY OF AGRICULTURE
UNIVERSITI PUTRA MALAYSIA
SERDANG, SELANGOR DARUL EHSAN
2016/2017**

CERTIFICATION

This project report entitled **INTERCROPPING SWEET CORN WITH TWO TYPES OF NAPIER GRASS AND LEGUMES TO ENHANCE YIELD AND NUTRITIVE QUALITY OF FORAGE MIXTURES** was prepared by **HAFIZAN BIN MOHAMAD** and submitted to the Faculty of Agriculture in fulfilment of the requirement of SHW 4999 (Final Year Project) for the award of the degree in Bachelor of Agriculture (Animal Science).

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LIST OF ABBREVIATIONS

“N..... North

CP.....Crude Protein

“E..... East

NDF... Neutral Detergent Fibre

°C.....Degree Celsius

ADF... Acid Detergent Fibre

mm.... Millimetre

ADL... Acid Detergent Lignin

m.....Metre

LSR... Leaf Stem Ratio

CRD...Complete Randomized Design

ml..... Millilitre

kg..... Kilogram

L..... Litre

g..... gram

EDTA. Ethylenediaminetetraacetate

ha.....Hectare

H₂SO₄. Sulphuric acid

:..... Ratio

±..... Plus, Minus

cm.... Centimetre

TRT...Treatment

N..... Nitrogen

P.....Phosphorus

K.....Potassium

%..... Percentage

DM.... Dry Matter

OM.... Ash

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BY HAFIZAN BIN MOHAMAD

ABSTRACT

Diversification cropping systems by multiple crop species, already considered as a way to solve some problems of modern agriculture which provides agronomic and economic options. The present study was conducted to determine the yield and nutritive quality of forage mixtures through intercropping sweet corn with Napier grasses and legumes. The specific objectives of this study were to determine the yield and to measure and compare the nutritive quality of forage mixtures of the sweet corn, Napier grasses, and legumes that cultivate through intercropping system. The study was conducted at Field 15, Crop Research Area and Nutritional Laboratory, Department Animal Science, Faculty of Agriculture, Universiti Putra Malaysia (UPM). The field study was carried out from June 2016 until August 2016. The experimental material consists of Sweet corn, tall Napier grass, dwarf Napier grass, and legumes with overall cultivation areas that was utilised about 15 m x 23 m. The treatments consist of four treatments with three replications including treatment 1 that intercrops between sweet corn with tall Napier grass (CTN). The treatment 2 was intercrops between sweet corn with tall Napier grass and legumes (CTL). The treatment 3 was intercrops between sweet corn with dwarf Napier grass (CDN). The treatment 4 was intercrops between sweet corn with dwarf Napier grass and legumes (CDL). The parameter of this study consists of vegetative production, chemical analysis, and botanical composition. In term of vegetative production, sweet corn plants height

shows no significant difference ($p < 0.05$) between all treatment but Napier grass plant height shows significantly difference ($p < 0.05$) between treatments. Napier grass tiller number shows significantly difference ($p < 0.05$) from week 1 until week 10 for all treatments. There are no significantly difference ($p < 0.05$) between all treatments for sweet corn and legumes dry matter (DM) yield but Napier grass DM yield shows significantly difference ($p < 0.05$) between all treatments. Leaf stem ratio (LSR) of sweet corn and Napier grass shows no significantly difference ($p < 0.05$) between all treatments. In term of nutritive quality, the contents of dry matter (DM), ash, crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), and acid detergent lignin (ADL) of sweet corn shows no significant difference ($p < 0.05$) between all treatments. The contents of DM, CP and ADF for Napier grass shows significantly difference ($p < 0.05$) between all treatments but shows no significant difference ($p < 0.05$) between all treatments for contents of ash, NDF, and ADL. The contents of CP and NDF for legumes shows significantly difference ($p < 0.05$) between all treatments but shows no significant difference ($p < 0.05$) between all treatments for contents of DM, ash, ADF, and ADL. In conclusion, the study indicates that intercropping sweet corn with Napier grass and legume can increased dry matter (DM) yield and nutritive value of forage mixtures. In addition, the vegetative production of sweet corn did not affect the Napier grass but produces good nutritive quality to ruminants. However, the inclusion of legumes influenced the assessed vegetative production, nutritive quality, and botanical composition of intercrop plants that shows highest value when inclusion of legumes compared to the exclusion of legumes.

**TANAMAN SELINGAN JAGUNG MANIS DENGAN DUA JENIS RUMPUT NAPIER
DAN KEKACANG UNTUK MENINGKATKAN HASIL DAN KUALITI PEMAKANAN
CAMPURAN FORAJ**

OLEH HAFIZAN BIN MOHAMAD

ABSTRAK

Sistem diversifikasi tanaman oleh spesies tanaman yang berbeza, sudah dianggap sebagai satu cara untuk menyelesaikan beberapa masalah pertanian moden di mana menyediakan pilihan agronomik dan ekonomik pelbagai. Kajian telah dijalankan untuk menentukan hasil dan kualiti pemakanan campuran foraj melalui selingan penanaman jagung manis dengan rumput Napier dan kekacang. Objektif khusus kajian ini adalah untuk menentukan hasil dan untuk mengukur serta membandingkan kualiti pemakanan campuran foraj tanaman jagung manis, rumput Napier dan kekacang yang ditanam secara sistem tanaman selingan. Kajian ini telah dijalankan di Ladang 15, Kawasan Penyelidikan Tanaman dan Makmal Pemakanan, Jabatan Sains Haiwan, Fakulti Pertanian, Universiti Putra Malaysia (UPM). Kajian lapangan telah dijalankan dari Jun hingga Ogos 2016. Bahan uji kaji terdiri daripada jagung manis, rumput Napier tinggi, rumput Napier "dwarf", dan kekacang dengan kawasan penanaman yang digunakan adalah 15 m x 23 m. Rawatan kajian merangkumi empat rawatan dengan tiga ulangan. Rawatan 1 iaitu selingan penanaman diantara jagung manis dengan rumput Napier tinggi (CTN). Rawatan 2 adalah selingan penanaman diantara jagung manis dengan rumput Napier tinggi dan kekacang (CTL). Rawatan 3 adalah selingan penanaman jagung manis dengan rumput Napier "dwarf" (CDN). Rawatan 4 adalah selingan penanaman jagung manis dengan rumput Napier "dwarf" dan kekacang (CDL). Parameter kajian terdiri daripada produksi vegetatif, analisis

kimia, dan komposisi botanikal. Dari segi produksi vegetatif, ketinggian tanaman jagung manis tidak menunjukkan perbezaan signifikan ($p < 0.05$) antara rawatan tetapi ketinggian tanaman rumput Napier menunjukkan perbezaan yang signifikan ($p < 0.05$) antara rawatan. Bilangan tiler rumput Napier menunjukkan perbezaan yang signifikan ($p < 0.05$) dari minggu 1 hingga minggu 10 untuk rawatan. Tiada perbezaan signifikan ($p < 0.05$) antara semua rawatan untuk hasil bahan kering (DM) jagung manis dan kacang tetapi hasil bahan kering (DM) rumput Napier menunjukkan perbezaan yang signifikan ($p < 0.05$) antara rawatan. Nisbah daun batang tanaman jagung manis dan rumput Napier tidak menunjukkan perbezaan signifikan ($p < 0.05$) antara rawatan. Dari segi kualiti pemakanan, kandungan bahan kering (DM), abu (OM), protein mentah (CP), neutral serat detergen (NDF), asid serat detergen (ADF), asid lignin detergen (ADL) jagung manis tidak menunjukkan perbezaan signifikan ($p < 0.05$) antara rawatan. Kandungan DM, CP, dan ADF untuk rumput Napier menunjukkan perbezaan yang signifikan ($p < 0.05$) antara rawatan tetapi kandungan abu, NDF, dan ADL tidak menunjukkan perbezaan signifikan ($p < 0.05$) antara rawatan. Kandungan CP dan NDF untuk kacang menunjukkan perbezaan yang signifikan ($p < 0.05$) antara rawatan tetapi kandungan DM, abu, ADF, dan ADL tidak menunjukkan perbezaan signifikan ($p < 0.05$) antara rawatan. Kesimpulannya, kajian ini menunjukkan bahawa selingan penanaman jagung manis dengan rumput Napier dan kacang boleh meningkatkan hasil bahan kering (DM) dan kualiti pemakanan campuran foraj. Di samping itu, produksi vegetatif jagung manis tidak dipengaruhi oleh rumput Napier tetapi menghasilkan kualiti pemakanan yang baik untuk ternakan ruminan. Walau bagaimanapun, penambahan kacang mempengaruhi produksi vegetatif, kualiti pemakanan, dan komposisi botanikal tanaman selingan menunjukkan nilai tertinggi apabila ada penambahan kacang berbanding tiada penambahan kacang.

CHAPTER 1

INTRODUCTION

Diversifying cropping systems by multiple crop species, already considered as a way to solve some problems of modern agriculture which provides agronomic and economic options. Diversification of crop also enhances management of plant pests or diseases with manipulation of pest or disease cycles, and lower risk against plants failures and to get different produces as a food and as alternative feeds to recover pastures during scarcity by intercropping system.

Intercropping is defined as simultaneous cultivation of crops and recently established in mostly region of the world (which involves the cultivation of two or more species in same area during the same seasons (Geiler *et al.*, 1991), and proven that it's not only been most effective than sole cropping (Remison, 1978) but also to enhance the whole ecosystem (Adelana, 1984; Costa *et al.*, 2012).

Sweet corn (*Zea mays var. saccharata*) mainly for production of corn cobs for human diets and the corn stalks usually process as agriculture by-product for animal diets. Sweet corn is the third most significant cereal crop of the world which was used as food, feed, and forage (Eskandari *et al.*, 2009). Nowadays, the vegetative part of sweet corn can be used for animal feeds to get maximum yield and nutritive quality. The inclusion of forage maize in ruminant diets can increase forage intake, improve animal performance, and possibly can decrease the production costs (Anil *et al.*, 2000). Sweet corn can be safely fed to all ages of animal do not contain anti nutritional factor like oxalic acid, prussic acid as in case of other cereal plants (Dahmardeh *et al.*, 2009).

Napier grass is an important forage in wet tropical regions that potentially can produce dry matter per unit area compared with other grass plants (Hanna *et al.*, 2004). Intercropping can benefit to utilize both of yield either for sweet corns or Napier grasses which after sweet corns was harvested, farmer can harvest the Napier grasses for animals feed (Nweke, 2015). The additional of grass such as Napier grass were provided adequate amount of nutritional requirement for animals. On the other hand, sweet corns and Napier grass also can be harvested together for fresh forage mixtures feed or silages after the sweet corn cobs was harvested.

The inclusion of leguminous plants to forage mixture will generally improve forage quality. The legume provides nitrogen for grasses and sweet corn and decrease the potential for nitrate poisoning through application of intercropping system. The addition of leguminous plants supports the development of residual cover with better characteristics while not only including the protection of soil but also including to the nutritional of the intercropping practices by increasing the nitrogen uptake that promoted from legumes (Bortolini *et al.*, 2000).

The benefit of intercropping sweet corn with Napier grass and legumes for the small farm will help to increase the crude protein (CP) content that existed in the corn stalks which making necessary for animal feed. In addition, intercropping sweet corn with Napier grass and legumes can give advantages through imply a more efficient usage of resources such as space area, soil fertility, moisture, solar radiation, and others environmental growth factors within the farmer's socio-economic circumstances to maximize yield with minimum risk, minimum input, and maximum ecological stability (Shiva, 1984).

1.1 Objective

1.1.1 General objectives:

To determine the yield and nutritive quality of forage mixtures through intercropping sweet corn with Napier grasses and legumes.

1.1.2 Specific objectives:

1. To determine the yield of the sweet corn, Napier grasses, and legumes cultivated through intercropping system.
2. To measure and compare the nutritive quality of forage mixtures through intercropping sweet corn with Napier grasses and legumes.

1.2 Significance of Study

The study of intercropping sweet corn with Napier grasses and legumes helps to reduce the risk associated with pests and diseases attacks whiles complying a balance ecosystem functions including nutrient cycling, nitrogen fixation, soil regeneration, and biological control of pests and weeds. In addition, intercropping sweet corn with crops not affected by stem borer such as Napier grass can act as a trap crops that actually attracts and kills the stem borer. Napier grass has an odour that makes it more attractive to egg-laying adult moths. But most of the caterpillars are killed in the sticky sap of the Napier grass which contains a toxin deadly to the stem borer. Legumes also will be able to interrupt the life cycle of stem borer and add nutrients in the soil. Moreover, intercropping sweet corn with Napier grasses and legumes significantly will be able to enhance yield and nutritive quality of forage mixtures by making most effective usage of the overall use of resources availability that would not be utilized by a single crop.

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