UNIVERSITI PUTRA MALAYSIA

MANAGEMENT OF SAMBAR DEER (CERVUS UNICOLOR BROOKEI) UNDER AGROFORESTRY SYSTEM IN SARAWAK

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MANAGEMENT OF SAMBAR DEER (*CERVUS UNICOLOR BROOKEI*) UNDER AGROFORESTRY SYSTEM IN SARAWAK

By

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

MANAGEMENT OF SAMBAR DEER (*CERVUS UNICOLOR BROOKEI*) UNDER AGROFORESTRY SYSTEM IN SARAWAK

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Chairman : Professor Dr. Dahlan Ismail, Ph.D.

Faculty : Agriculture

Sambar deer breeding under existing forest plantation with local Sabal Tapang community participation was one of the Agroforestry projects implemented in Sarawak aimed at bringing socio-economic benefits to the shifting cultivators and to strike a balance in nature conservation.

The research and observation conducted during the implementation of this agroforestry deer breeding focused on the animal performance, initial effect of deer browsing behaviour on the plantation and attitude and perception of adjacent communities towards the overall agroforestry systems in Sabal.

Brody's Growth Model was the most suitable model for deer production under this system. The appropriate age of venison production was about two years when the animal weighed around 74.2 kg. Sambar deer was found to have no definite breeding season. The sex ratio of fawn male to female was 1:1.5, female became

sexually mature at 23.1 months, fawning interval was 11.3 months and gestation was 257 days. The period of stag which did not cause damage to vegetation was 4.7 months compared to the long period of 6.9 months of destructiveness to the trees stand as a result of rubbing and territorial marking.

There were 22 known families of woody plant and another 10 families of non-woody plant found in the 12-year old *Acacia mangium* plantation. A total of more than 21 species were eaten by 14 heads of Sambar deer over a total observation of 65 days within an area of 8.0 ha. Sambar deer browsing was highest in *Ficus spp.* (34%) for all leaves, fruits and bark; followed by *Dillenia sp.* shoots (30%); *Agrostistachys sp.* leaves (8%) and *Macaranga spp.* leaves (7%). The maximum limit of browsing was observed at height of 4 m with diameter of less than 3.8 cm. The browsing pattern based on nutritional selectivity was shown in species with high dry matter digestibility, crude protein, fibre, potassium, calcium, copper and zinc content. The other factors affecting the browsing pattern were microhabitat and closeness to perimeter fence. It was found that more than 70 percent of tracks and trampling happened near to stream and near to fence compared to only 20 percent observed in the middle of paddock.

The criteria for villages acceptance of agroforestry projects were (1) ease of management; (2) fast economic returns; (3) proximity to village and; (4) involving direct participation of local people in most of the activities.

With the knowledge on the findings made, this system definitely addresses the call for sustainability of production as highlighted in the Third National Agricultural Policy which emphasize on exploitation of indigenous species and integrated farming.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk Ijazah Sarjana Sains

PENGURUSAN RUSA SAMBAR (*CERVUS UNICOLOR BROOKEI*) DI BAWAH SISTEM HUTAN-TANI DI SARAWAK

Oleh

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Pemeliharaan rusa Sambar tempatan di dalam ladang hutan sedia ada, dengan penyertaan oleh penduduk Sabal Tapang merupakan salah satu projek Hutan-tani yang dilaksanakan di Sarawak. Ia bertujuan untuk memberi keuntungan sosio-ekonomi kepada masyarakat pertanian pindah dan dalam mengimbangi pemeliharaan alam sekitar.

Semasa pelaksanaan projek ini, kajian dan pemerhatian yang dibuat ialah mengenai keupayaan rusa Sambar, kesan awal sifat pemakanan rusa ke atas ladang hutan dan sikap penduduk tempatan terhadap program hutan-tani.

Keterangan mengenai model pertumbuhan rusa sambar projek ini adalah lebih sesuai menggunakan Model Pertumbuhan Brody. Usia rusa sambar yang sesuai untuk pengeluaran daging adalah di antara dua tahun apabila beratnya di dalam lingkungan 74.2 kilogram. Pembiakan rusa sambar didapati tidak bermusim,

nisbah anak jantan:betina adalah 1:1.5, betina mencapai peringkat mengawan pada umur 23.1 bulan, jarak peranakan adalah 11.3 bulan dan mengandung selama 257 hari. Rusa jantan didapati mempunyai tanduk keras selama 6.9 bulan dan akan mengakibatkan kerosakan pada batang pokok berbanding dengan 4.7 bulan semasa tanduk gugur dan tumbuh semula.

Terdapat 22 jenis keluarga kayu dan 10 jenis keluarga bukan kayu di dalam ladang *Acacia mangium* yang berusia 12 tahun di Sabal. Kajian pemerhatian selama 65 hari dalam kawasan seluas 8 hektar mendapati bahawa lebih daripada 21 spesis tumbuhan telah dimakan oleh 14 ekor rusa. Spesis yang paling kerap dimakan oleh rusa adalah mengikut urutan seperti *Ficus spp.* (34%) merangkumi daun, buah dan kulit; pucuk *Dillenia sp.* (30%); daun *Agrostistachys sp.* (8%) dan daun *Macaranga spp.* (7%). Rusa sambar boleh mencapai pemakanan pada ketinggian maksima 4 meter pokok kayu dengan garis pusat 3.8 sentimeter. Corak pemakanan rusa adalah berasaskan pemilihan mengikut nilai kandungan zat seperti penghadaman berat kering, protein, gentian, kalium, kalsium, kuprum dan zink yang tinggi. Faktor-faktor lain menentukan corak pemakanan rusa adalah mikrohabitat dan jarak dari tepi pagar. Kajian mendapati lebih daripada 70 peratus kesan tapak dan penggunaan oleh rusa sambar letaknya di kawasan sekitar anak sungai dan tepi pagar berbanding hanya 20 peratus di kawasan pertengahan keseluruhan kawasan.

Kriteria penerimaan projek hutan masyarakat/hutan-tani oleh penduduk tempatan adalah berasaskan pada (1) tahap pengurusan yang mudah; (2) cepat

mengeluarkan hasil pulangan; (3) berdekatan dengan tempat kediaman dan; (4) melibatkan penyertaan mereka secara langsung dalam semua aktiviti.

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LIST OF ABBREVIATIONS / GLOSSARY OF TERMS

ADF	- Acid Detergent Fibre
CF	- Crude Fibre
CITES	- Convention on International Trade in Endangered Species
CP	- Crude Protein
DM	- Dry Matter
DMD	- Dry Matter Digestibility
DOA	- Department of Agriculture
EE	- Ether Extract
GE	- Gross Energy
IRAD	- Integrated Rural Area Development
IRPA	- Intensive Research Priority Area
ITTO	- International Tropical Timber Organisation
MAFF	- Ministry of Agriculture, Fisheries and Food
M.A.H.M.	- Master of Art in Health and Ministry
MARDI	- Malaysian Agricultural Research and Development Institute
ME	- Metabolisable Energy
MEA	- Metabolisable Energy Available
MER	- Metabolisable Energy Required
M.P.H.	- Master of Public Health
MRB	- Malaysian Rubber Board
NAP3	- Third National Agriculture Policy (1998 – 2010)
NCR	- Native Customary Right
NDF	- Neutral Detergent Fibre
NZTCI	- New Zealand Technical Correspondence Institute
OPF	- Oil Palm Frond
PFE	- Permanent Forest Estate
TPA	- Totally Protected Area

CHAPTER 1

INTRODUCTION

1.1 Overview on Agroforestry

Agroforestry was brought from the realm of indigenous knowledge into the forefront of agricultural research less than two decades ago, and was promoted widely as a sustainability-enhancing practice that combines the best attributes of forestry and agriculture (Bene *et al.*, 1977, Steppler and Nair, 1987). Agroforestry is one of the activities usually implemented under the community forestry programme. The definition of Agroforestry has been much debated but what make up of all agroforestry systems according to Nair (1993) are the possession of three attributes as follows:-

a. Productivity : Most, if not all agroforestry systems aim to maintain or increase production (of preferred commodities) as well as productivity (of the land);

b. Sustainability : By conserving the production potential of the resource base, mainly through the beneficial effects of woody perenials on soils, agroforestry can achieve and indefinitely maintain conservation and fertility goals;

c. Adaptability : Agroforestry has already been accepted by the farming