# Development of Sustainable Livestock-Crop Integration Production Systems

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## Introduction

Protein food production derived from livestock such as meat, milk and egg is very important for the national food supply and security. Recently, the country spent more than RM 10 billion for importing food items mostly food from animal origins and feed grains. Malaysia has sufficient resources for the production of food items locally. The resources can be derived from plantation sector, agricultural by-products and agro-based industries. These resources can be integrated to develop a sustainable livestock-crops production system in the country (Dahlan et al. and Shahar, 1992). Efficient and sustainable production systems must be developed through utilisation of available and regenerated resources locally. Regenerated resources such as agriculture products, forestry and livestock can be produced optimally through integrated production systems. Works on cattle, sheep and goat integration under oil palm and rubber plantations have shown remarkable results (Dahlan, et. al, 1993 and 1995, Chen et al. and Dahlan et al., 1996, Wattanachant et. al, 1997, Dahlan et al., 1993). Other species of livestock such deer and poultry should be introduced to plantation area (Dahlan et al., 1996). These integrated production systems should be improved and sustained for more efficient agriculture especially food production systems in the country. Livestock-crops integrated production systems (LICRO) is believed to be the most efficient agricultural production system exist in the country and it is the future direction for the livestock production in Malaysia. The objectives of this research are to develop sustainable livestock production system through optimising the use of suitable livestock species, land and manpower and development of environmental friendly ecosystems for livestock-crops production and agro-tourism.

## Materials and Methods

Systems approach was used in this research project. The approach was considered multi-disciplinary input-output relationship and dynamic situation in the complex systems. The main resources and/or components such as plantation crops, agricultural land usage, manpower utilisation, feed resources and livestock species were integrated into new production systems named "LICRO" and were evaluated synergistically. The techniques employed in LICRO systems are *in situ* experimentation, livestock management strategies, feed resources evaluation, multi-level validations, modelling and simulation, information network, products processing and marketing strategies. Main experimentations were evaluation of livestock-crops management strategies, feed resources evaluation and processing, and suitability of livestock species (cattle, sheep, goat, buffalo, deer, poultry species and wildlife). Research in the development of technology in livestock products processing, agriculture by-products feed processing was conducted. Marketing and socio-economic studies were included in the evaluation of the production system.

## Results and Discussion

This research showed that cattle-oil palm integration is a successful programmed. Cattle especially beef cattle will be the main livestock project proposed for the country. Integration of cattle with oil palm plantations should be introduced in matured plantations. This production system will contribute significant return to investment to the livestock and plantation sectors (Dahlan et al. and Shahar, 1993). Suitable types or breeds of cattle need to be identified and introduced to oil palm plantations. Other species of livestock showing promising results when integrated with oil palm plantations are deer (Dahlan et al., 1998) and buffalo (Dahlan et al. and Shamsul, 1997). Deer can be integrated with higher stocking rate than cattle, rusa deer (*Cervus timorensis*) can be stocked about 8 to 10 heads/ha in matured oil palm plantations. Buffalo is very suitable for draught power in oil palm plantations especially for carrying oil palm fresh fruit bunch, with optimal load around 1,560 kg for 600 kg buffalo (Dahlan et al. and Shamsul, 1997). Integration of wildlife *herivores*, such as deer (*Cervus timoreensis, C. unicolor and Axis axis*), kijang (*Muntiacus muntjak*), mousedeer (*Tragulus javanicus*), porcupine (*Hystrix brachyura*) and avian species (jungle fowl and pheasant) with *acacia* plantation (*Acacia mangium*) under agroforestry systems creates suitable and sustainable "Bio-park" environment and conservation of fauna and flora (Dahlan et al., 1998 and Dahlan et al.and Jiwan, 1998). Oil palm frond (OPF) was found to be the most suitable forage source for the LICRO systems (Dahlan et al., 1993). OPF is abundantly available and its quality is sufficient for fibre feed supplementation for ruminants in LICRO systems (Dahlan et al., 1992 and 1996). OPF can be used as fresh chopped materials, silage and pelleted compound feed (Dahlan et al., 1996).

## Conclusions

LICRO system is the most sustainable production system for ruminants and perhaps some wildlife species such as deer, mouse deer and jungle fowl in the

country. The results showed that the plantation sector and farmers have accepted the concept of LICRO systems to be adopted in most of oil palm plantation in the country. Beef cattle is the most suitable ruminant to be integrated with oil palm plantations. Deer is also suitable new livestock species to be farmed in this country through adopting LICRO system. BIO-park is an additional contribution of LICRO systems towards recreation and environmental conservation. Oil palm frond (OPF) is the main fiber feed source for supplementary feed in the LICRO systems.

## Benefits from the study

The study contributed significantly in the development of suitable and sustainable livestock production system - LICRO systems,development of bio-park and recreational area within plantation sectors, and identification and development of supplementary feedstuff for the LICRO systems such as OPF and agricultural by-products. In addition, it shaded some light on the production of protein food such as meat, milk and egg from efficient LICRO systems as well as techniquecs for producing breeding animals and reservation of wildlife species.

## Literature cited in the text


Chen, C.P. and Dahlan, I. 1996. Tree spacing and livestock production. In. The 1st. Intl. Symposium on Integration of livestock to oil palm production. MSAP-FAO Publ. Pp. 35-49.

Dahlan, I. 1992, The nutritive values and utilization of oil palm leaves as a fibrous feed for goat and sheep. Proc. 6th. Asian-Australasian Animal Production congr. Bankok, Pp. 271.

Dahlan, I. 1993. System analysis application for integrated small ruminant-tree cropping production systems. IPT/IDRC, 1992 In Advances in sustainable small-ruminant-tree cropping integrated systems. Pp. 45-54.

Dahlan, I. 1996. Oil palm by-products: Its utilization and contribution to livestock industry. Proc. PORIM International Palm Oil Conger. Planery paper. Pp. 269-274.

Dahlan, I. 1998. Management and feeding of mouse deer (Tragulus spp.) in captivity and bio-parks. Proc. Symposium series 2, the 8th. World Conference on Animal Production, Seoul, Korea.Pp. 476- 484.

Dahlan, I. and Jiwan, M. 1998. Bio-park animals: Bornean yellow muntjac. Proc. 20th. MSAP Conf. Putrajaya. Pp. 173-175.

Dahlan, I. and Shahar, M.. 1992. Simulation models for quantities decision in crop-livestock integrated farming systems. Asian Farming System Journal. 1(3): 351-360.

Dahlan, I. and Shamsul, B.M.T. 1997. Buffalo draught power for oil palm plantations. Buffalo Bulletin. 16(3): 64-67.

Wattanachant, C., I. Dahlan, and Rajion, M.A.1997. Sheep-oil palm integration: body composition of Dorset x Malin sheep. Mal. J. Anim. Sc. 3 (2): 22-27.


## Publications in the Refereed Journal

None.

## Publications in Conference Proceeding

None.

## Graduate Research

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