Journal of Sustainable Development
www.ccsenet.org/journal.html
Vol. 2, No. 3
November 2009

Food Preferences of Seladang (Bos gaurus hubbackki) in Ulu Lepar, Pahang, Peninsular Malaysia

Ebil Yusof
Wildlife Ecological Research Unit (WILDER)
Department of Forest Management
Faculty of Forestry
University Putra Malaysia
43400 UPM, Serdang, Selangor, Malaysia
Tel: 60-3-8946-7207 E-mail: ebil@putra.upm.edu.my

This project was funded by the University Putra Malaysia.

Abstract

Seladang food preferences primarily depended on the habitat types within their home range. Shrubs and grasses were their main food sources. The types of food species preferred by seladang in each habitat types were unknown. In this study, the food species were identified and classified according to the intensity of browsing and grazing capacity of seladang within each habitat type such as in the primary forests, secondary forests and agricultural areas. Study plots and sub-plots were selected based on feeding habit and footprint signs. The results of this study found that 17 species of shrubs and 6 species of grasses were preferred by seladang. *S. acuminata* (7.95%) was the most preferable species of shrubs in the primary forest, *Melastoma malabathricum* (10.42%) in the secondary forest and *Erythrina variegata* (18.56%) in the agriculture area. The amount of grass species eaten by seladang is not significantly different but *Imperata cylindrica* was grazed in the primary forest compared to *Paspalum conjugatum* in the secondary forest and *Paspalum vaginatum* in agricultural area.

Keywords: Seladang, Food preferences, Shrubs, Grasses

1. Introduction

Habitat is defined as an area where an organism lives and meets its basic needs for food, water, cover and space to survive. Each species of wildlife has different habitat requirements.

Wildlife habitat plays a vital role in the ecological and biological processes that are essential to life itself. The functioning of the biosphere, and hence the maintenance and enhancement of human life, depends on countless interactions among plants, animals and micro-organisms.

Wildlife habitat regardless of whether it is terrestrial, marine or wetland habitats, is significant because of a number of functions it performs to support wildlife. These include (a) food for browsing (the twigs and buds of shrubs and trees), and foraging (grasses and legumes); (b) water that they need directly from the food they eat; (c) cover to protect themselves from predators, resting, rearing their young and protection against inclement weather and (d) Space for a territory or home range of the year.

Several investigators have used subjective methods to classify the extent of browse utilization by wildlife species. Robert and Gary (1997) reviewed the methodologies used to estimate browsing frequencies of wildlife species. Frequently, browsing plants were estimated as: (1) no browsing to light browsing; (2) moderate and (3) severe. While others used of -H- to designate heavy browsing (50-100 percent of a plant showing evidence of utilization), -M- for moderate (10-50 percent of plant utilized) and "L" for light (“T” for trace that is less than 10% of a plant utilized).

First study of seladang feeding habits was accomplished through field observation in Endau Rompin State Park (Ebil, 1991). He found that seladang utilized most the plants they like best. Many wildlife researchers are inclined to consider those plants utilized most as the ones most preferred. Such observations may be misleading because of the effect of

geographical influence on plant abundance and palatability, and on the stage of succession of the habitat regarding availability of certain plants. For example, some of the less preferred plants may receive heavy utilization on overstocked range (Provenza & Balph, 1987).

Subjective measurement data of seladang utilization and food preference can be gathered rather quickly, so large areas often can be sampled in a relatively short time. One subjective habitat evaluation technique based on available forage, described by Peek (1986) provided a useful index to forage abundance and required about 20 percent of the time required for analogous vegetative sampling techniques.

Twig count and twig length are two direct methods of measuring food utilization and preference of wildlife species in the field. In the twig-count method, browsed and un-browsed twigs on each sampled plant are counted and their ratio expressed as a percentage (Jensen & Scooter 1997). The investigators used variable-sized plots (1-2 mili-acres to 0.0025 acre), some of which were shaped as transects, often permanently installed and systematically established to represent the important habitats. The twig-length method determines the average normal length of twigs and the average length after browsing. Deer use is expressed as a percentage of normal twig length. These lengths may be measured or estimated. Ebil (1991) used the twig-count method to estimate the amount of current twig growth grazed on shrubs or browsed on grasses.

Previously more works have been done in the primary forest and least information from the other components of seladang habitat. In fact seladang consists of primary forest, secondary forest and agriculture areas. This entire habitat requires varieties of vegetation, minimum supply of water, adequate amount of shelter and space, which are needed for the species to survive in a specific location of their home ranges. To meet seladang habitat requirement in the area is one of the biggest challenges for the biologists and managers. A more comprehensive approach must be part of the management program rather than solely let the animals wondering inside the disturbed forests.

To fulfill their need and assure the conservation of seladang species, some inputs through research should be incorporated into the management programs. Many essential factors are needed for managing the seladang species especially the present habitat that is food preferences.

Seladang is a wide spectrum feeder that feed on grasses, herbs, shrubs, vines and trees saplings in undisturbed condition. Among grasses species taken that observed by Khan (1973) and Ebil (1982) are Rumput Chengkenit (*Paspalum conjugatum*), Centro legume (*Centrocima pubcsens*) and bamboo grass (*Danim triganum*). Feeding continues in secondary forest, browse on shrubs, plants, trees, woody vines, and creepers. Some of the most browsed items Mengkirai (*Trema angustifolia*), Mengkirai Bulu (*Trema tomentosa*), Mahang (*Macaranga spp*.), Simpoh spp. (*Dillenia ovata* and *D. indica*) and Petai kerayong (*Parkia javanica*) are favourite fruit of the seladang. Temperature influenced the feeding duration and the seladang may move into the primary forest for shelter. The second feeding cycle of the day lasted about 3 hours (from 5pm to 8 pm) in the secondary and oil palm plantation. Under natural condition each herd spent almost two weeks for browsing and grazing in one particular area before all of them start to move to the other part of their home range (Conry, 1980 and Conry, 1981).

The study on food preferences of seladang includes identification of food varieties and their availability between the habitat types in the Ulu Lepar area.

2. Methods

This study was conducted in Ulu Lepar, Kuantan, Pahang from 1st. November to 27th. December 2006. The nearest town is Pekan Sri Jaya that is about 14km from the study site. This area consists of three landscape types that include lowland dipterocarp forest, secondary forest, and oil palm estate (Figure 1).

The establishment of the first and subsequent plots was based on the seladang signs such as dung, beds, rest sites or feeding signs. Two plots were designed for primary forest, secondary forest and oil palm plantation respectively. A total of 72 sub-plots were established in the study area. Each plot consists of 12 sub-plots of 20mx20m dimension and each vegetation species eaten the plots were identified and recorded (Figure 2). The sub-plot was made randomly as suggested by Ebil (1981). Twig-count method was used to estimate the amount of current twig growth grazed or browsed on saplings, shrubs and grasses.

3. Results

3.1 Shrubs

A total of 17 species of shrubs were recorded in the study area. Most of the species were commonly found in the primary, secondary and agricultural areas. The twig count of shrubs species counted from twenty-four sub-plots in the primary forest, secondary forest and agriculture areas were 4968 twigs, 6086 twigs and 3098 twigs respectively (Table 1). From the table, the four most preferred species of shrub that the seladang browsed in the primary forest were *S. acuminata* (7.95%), *S. parvifolia* (7.37%), *Goniothalamus spp* (7.37%) and *Melastoma malabathricum* (7.21%). The five least preferred shrubs species eaten at the primary forest were *D. aromatica* (4.27%), *Dillenia ovata* (4.51%),

Macaranga tanarius (4.53%), *Scaphium spp.* (5.09%) and *Trema angustifolia* (5.15%).

In the secondary forest *Melastoma malabathricum* was the most preferable species of shrubs eaten by seladang with 10.42%. These were followed by *Intsia Palembanica* (8.12%), *Macaranga tanarius* (7.49%), *S. acuminata* (7.10%) and *S. parvifolia* (6.84%). Majority of sub-plots in the secondary forest had *Melastoma malabathricum* and became favorable food species to the seladang. *Atalantia monophylla* (3.30%) and *lithorcapus spp* (3.5%) were recorded as the least preferred species eaten by seladang in the secondary forest.

Results in Table 1 also indicated that food variety for seladang was limited to only ten species in the agriculture area. Shrub species such as *S.parvifolia, S. acuminata, Intsia Palembanica, Atalantia monophylla, Scaphium spp.* and *D. aromatica* were absent in the agriculture area. The most five preferred species of shrubs eaten by seladang were *Erythrina variegata* (18.56%), *Macaranga gigantea* (11.9%), *Parkia javanica* (10.75%), *Macaranga tanarius* (10.68%) and *Trema orientalis* (10.01%).

Results in Table 2 shows that both the amount of twigs eaten compared to the available grass species and locations (sub-plots) in the primary forest were significantly different at $p< 0.010$ and $p< 0.006$ respectively. In the secondary forest, twigs-species were highly significantly different ($P<0.000$). ANOVA also indicated that the twigs eaten by seladang between sub-plots were not significant different ($p<0.826$). Similar pattern indicated with the twigs and species eaten by seladang in the agriculture area was highly significant different ($P<0.000$) among the species.

3.2 Grasses

Grass species eaten by seladang from each sub-plot of the primary forest, secondary forest and agriculture areas were summarized in the Table 3. There were only six species of grasses found in this study area. A total of 3056 twigs of grasses were eaten by seladang in an agriculture area. Out this total 19.76% was *Paspalum vaginatum* and it was the most preferable grass species eaten by seladang compared to *Panicum maximum* (12.51%) in this area. In the secondary forest*, Paspalum conjugatum* (20.80%) was the most preferable. However, out of 1663 twigs count for all grass species in the primary forest 19.06% of *Imperata cylindrica* was eaten by seladang.

Table 4 was a summarized ANOVA for grass species in the three habitat types at Ulu Lepar, Pahang. As the amount of twigs was compared to the grass species in the primary forest, secondary forest and agriculture area, none of them was significantly different. However, comparison between the amount of twigs eaten and sub-plots was significantly different both in primary and secondary forests at $P<0.002$ and $P<0.049$ respectively.

4. Discussions

Seladang is among small ruminant's mammal species that require large quantities of easily digested food in order to satisfy their metabolic requirements for maintenance, growth and reproduction. These animals spent most of the time in their habitat are searching for food of the best quality. This is shown by diverse type of food species in the diets. The different habitat types within the home range influenced the availability of the preferred species eaten by seladang. Thus, the seladang has to move quite a distance in the home range. The phrenology of herbaceous and woody plant species changes with the types of habitat. This variation in the locality of plants is accompanied by changes in nutrient composition and in digestibility by seladang (William, 2006).

Results in the Tables 1 were showing the browsing preferences of shrub species in the primary forest, secondary forest and agriculture area. The preferences on shrubs were estimated based on the number of twigs of shrub species eaten by seladang. The number of twigs for shrub species in the secondary forest was highly browsed by seladang compared to the primary forest (6086 twigs). The amounts of shrub species found in the secondary forest are young, shorter in height and abundance. However, in the primary forest many shrub species are trees and less number of young saplings. In the agriculture area, the browsing activities were low as the area was planted with mono crops species (oil palm trees). From direct observation made in the study area, shrub species were abundant mostly at the fringes of the forest boundary. There were less species of shrubs in the agriculture area.

The differences in feeding preferences could be due to the availability of the shrub species dominant in that location within the home range. Quality of food and energy requirements for different age and sex classes at different times of the year of seladang also influences feeding preferences (Saharudin, 1984). In secondary forest for example, the effect of after logging may encourage *Melastoma malabathricum* (Senduduk) species to emerge and geminates at faster rate over the open spaces and established as dominant species with vast areas.

The amount and species of grasses eaten by seladang varied from one location (habitat types) to another. Results in Table 3 indicated that preferred grass species to be grazed by seladang dependence of habitat types. In the primary forest, *Imperata cylindrica* was highly dominated in most of the sub-plots that readily to be grazed by seladang before rests as local temperature discourage them to proceed to the open spaces in the agriculture area. *Paspalum conjugatum* was highly preferred among the grass species by seladang in the secondary forest. But, the characteristics of *Paspalum vaginatum* that occupies an exclusive niche of saline and wet conditions attract seladang to graze more of these species

while searching for the water supply. Thus, *Paspalum vaginatum* become more preferable than any other available grasses found in agricultural area.

Results in Tables 3 also showed that the feeding trend of seladang on grasses species differed as they moved from primary forest to agriculture areas. In the agricultural area grazing of grasses are more prominent over primary and secondary forest. This was due to higher amount of grasses regardless of the species in agricultural area compared to primary and secondary forests.

Seladang populations can grow to exceed their food supply. An overuse of foods within its habitat may reduce the productivity of the food population and resulting in lower productivity after overuse. Consequently, food shortages result in starvation and low birth rates, unless some other factor reduces numbers of other competitors (Charles & Tony 2001).

5. Conclusion

From this study, it is found that seladang likes to eat varieties of food species. The percentage of shrubs species eaten by seladang in the study area was significantly different as most of the shrubs found in each habitat greatly governed by the forest type. The species of grasses such as *Imperata cylindrica, Paspalum conjugatum* and *Paspalum vaginatum* that found in the study area could be excellent indicators for the present of seladang in each habitat type. It is strongly recommended that future study on the indicator of food preference for seladang. Further study on the food contents *Imperata cylindrica, Paspalum conjugatum* and *Paspalum vaginatum* as future findings could help the management of seladang using Ex-situ approaches to consider the types of food species to be introduced in the paddocks.

Efficiency of data collection could increase the accuracy of the results. This could be done with more plots which cover the study area. Study duration also influenced the accuracy of the results. The future study should consider to be carried out for longer period to examine diversity of food and it's different.

References

Charles T. R and, Tony J. C. (2001). Wildlife Feeding and Nutrition, Second Edition. Academic Press, New York, pp 161.

Conry, P. (1981). Habitat selection and use, movements and home range of the Malayan seladang (Bos gaurus hubbacki) in Central Pahang, Malaysia.Unpublished M.Sc. thesis, University of Montana.

Ebil, Y. (1981). A Review of the Malayan Seladang (Bos gaurus hubbacki). Department of Wildlife and National Parks.

Ebil, Y. (1982). Habitat requirement for the Malayan Gaur. J. Wildl and Parks 1: 7-16.

Ebil, Y. (1991). The study of forage utilization of seladang in Ulu Lepar, Pahang. J. Wildl. and Parks. 11:1-11.

Jensen, C.H., and G. W. Scooter. (1997). A comparison of twig-length and browsed-twig methods of determining browse utilization. J. Range Manage. 30:64-67.

Momin, Khan, M. K. (1973). Studies on the seladang (Bos gaurus) in the State of Perak. Malaysian Nature Journal 26:163-169.

Peek, J.M. (1986). A review of wildlife management. Prentice-Hall, Englewood Cliffs, NJ. 486.

Provenza, F.D., and D.F. Balph. (1987). Diet learning by domestic ruminants: theory, evidence and practical implications. Appl. Anim. Behav. Sci. 18:211-232.

Saharudin, A. (1984). Habitat sustainability Index Model: Seladang (Bos gaurus hubbacki). J. Wildl. and Parks. 3: 68-74.

Robert, A. G and Gary C. W. (1997). Analysis of Wildlife Radio-Tracking Data,. Publisher: Elsevier , 121 pp.

William, J. S. (2006). Ecological Census Techniques: A Handbook. Cambridge University Press, New York, 136 pp.

Table 1. Percentage of twig of shrubs species eaten by seladang in different habitat types at Ulu Lepar, Pahang

	Primary			Secondary			Agriculture		
Species	N	Mean	%	N	Mean	%	N	Mean	%
Dillenia ovata (Simpoh gajah)	224	17.92	4.51	225	9.38	3.70	NA	NA	NA
Melastoma malabathricum (Senduduk)	358	28.64	7.21	634	26.42	10.42	225	9.38	7.26
Shorea parvifolia (Meranti sarang punai)	366	29.28	7.37	416	17.33	6.84	NA	NA	NA
Shorea acuminata (Meranti rambai daun)	395	31.60	7.95	432	18.00	7.10	NA	NA	NA
Intsia Palembanica (Merbau)	270	21.60	5.43	494	20.58	8.12	NA	NA	NA
Erythrina variegata (Dedap)	266	21.28	5.35	415	17.29	6.82	575	23.96	18.56
Macaranga tanarius (Mahang semut)	225	18.00	4.53	456	19.00	7.49	331	13.79	10.68
Macaranga gigantea (Mahang kapur)	267	21.36	5.37	263	10.96	4.32	359	14.96	11.59
Trema angustifolia (Mengkirai)	256	20.48	5.15	390	16.25	6.41	264	11.00	8.52
Trema tomentosa (Mengkirai bulu)	282	22.56	5.68	342	14.25	5.62	310	12.92	10.01
Parkia javanica (petai)	334	26.72	6.72	343	14.29	5.64	333	13.88	10.75
Goniothalamus spp (Mempisang)	366	29.28	7.37	201	8.38	3.30	NA	NA	NA
Scaphium spp (Kembang semangkok)	253	20.24	5.09	315	13.13	5.18	NA	NA	NA
Atalantia monophylla (Merlimau)	282	22.56	5.68	293	12.21	4.81	225	9.38	7.26
Lithocarpus spp (Mempening)	320	25.60	6.44	213	8.88	3.50	210	8.75	6.78
Dryobalanops aromatica (Kapur)	212	16.96	4.27	294	12.25	4.83	NA	NA	NA
Endospermum malaccense (Sesendok)	292	23.36	5.88	360	15.00	5.92	266	11.08	8.59
Total	4968			6086			3098		

Table 2. Analysis of variance (ANOVA) for shrubs species in the three habitat types at Ulu Lepar

Habitat types	Compare	Sum of Squares	df	Mean Square	F	Sig.
Primary forest	Twigs - Species	2032.46	16	127.03	2.046	0.010
	Twigs - Plot	2759.73	23	119.99	1.956	0.006
Secondary forest	Twigs - Species	8351.33	16	521.96	5.44	0.000
	Twigs - Plot	1896.58	23	82.46	.720	0.826
Oil Palm Plantation	Twigs - Species	4254.07	9	472.67	5.29	0.000
	Twigs - Plot	2346.39	23	102.02	.98	0.490

$\alpha < 0.05$

Table 3. Percentage of grass species eaten by seladang in different habitat types at Ulu Lepar, Pahang

	Primary			Secondary			Agriculture		
Species	N	Mean	%	N	Mean	%	N	Mean	%
Centrocima pubcsens (Selaput tunggul)	268	11.17	16.12	347	14	15.01	497	20.71	16.26
Paspalum conjugatum (Rumput chengkenit)	283	11.79	17.02	481	20	20.80*	452	18.83	14.79
Paspalum vaginatum (Rumput dawai)	308	12.83	18.52	391	16	16.91	604	25.17	19.76*
Danim triganum (Rumput buluh)	279	11.63	16.78	392	16	16.96	478	19.92	15.64
Panicum maximum (Rumput kuda/sambar)	208	8.667	12.51	353	15	15.27	453	18.88	14.82
Imperata cylindrica (Lalang)	317	13.21	19.06*	348	15	15.05	572	23.83	18.72
Total	1663			2312			3056		

Table 4. Analysis of variance (ANOVA) for grass species in the three habitat types at Ulu Lepar, Pahang

Habitat types	Compare	Sum of Squares	df	Mean Square	F	Sig.
Primary Forest	Twigs - Species	310.12	5	62.02	1.09	.368
	Twigs - Plot	2481.16	23	107.88	2.28	.002
Secondary forest	Twigs - Species	318.25	5	63.65	0.83	.533
	Twigs - Plot	2599.08	23	113.00	1.63	.049
Oil Palm Plantation	Twigs - Species	853.47	5	170.70	1.30	.268
	Twigs - Plot	3375.22	23	146.75	1.13	.327

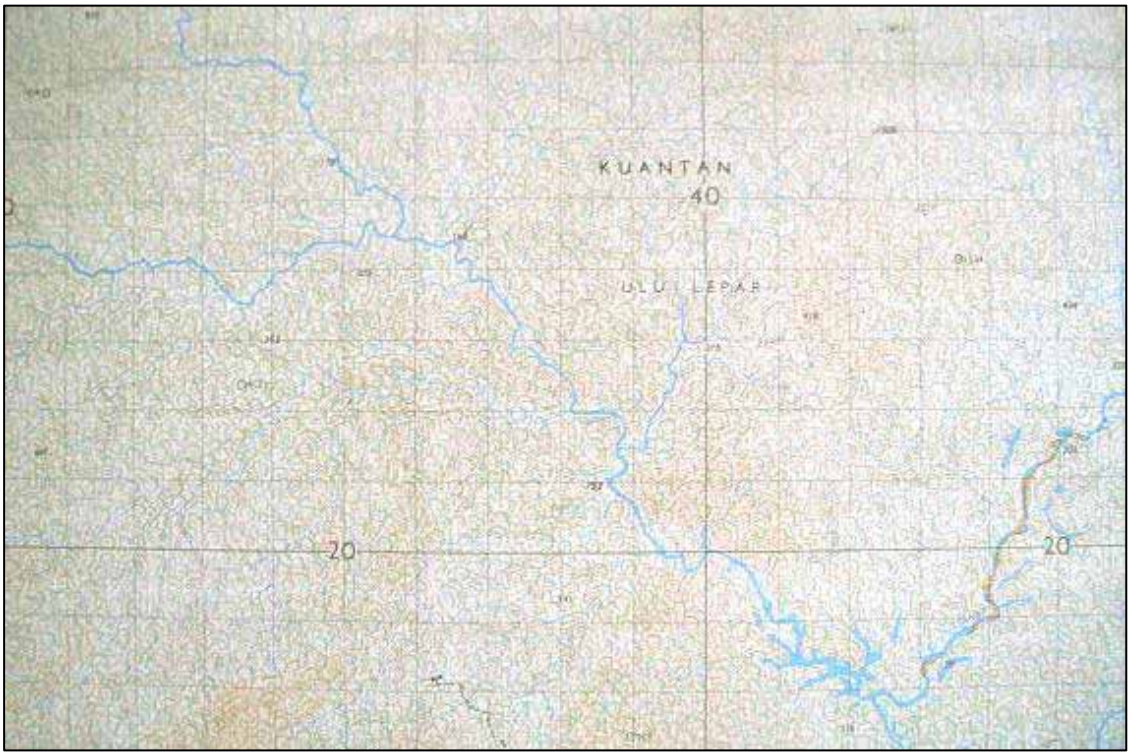

Figure 1. The study area at Ulu Lepar Pahang consisting of primary forest, secondary forest and agriculture area with an estimated size of 13,000 ha and drained by two major rivers such Sungai Lepar and Sungai Berakit.

Estimated number of seladang is 96 animals (Ebil 1981).

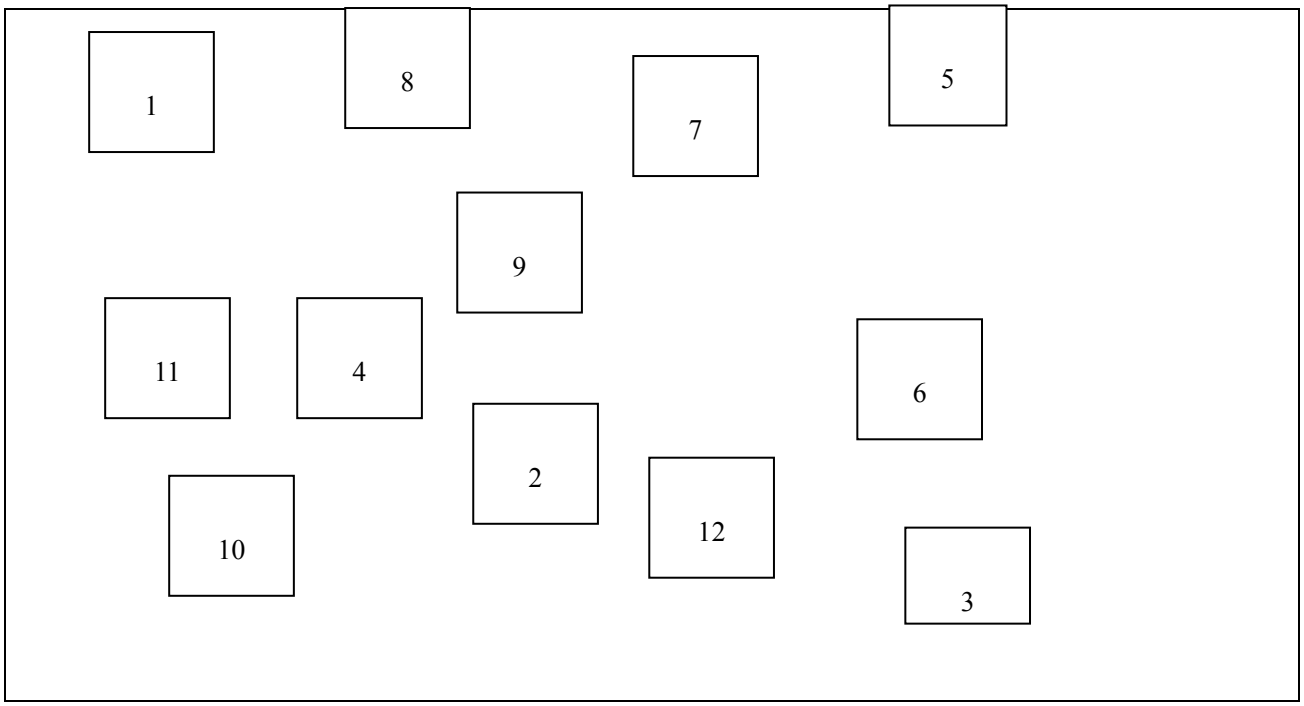

Figure 2. Design of sub-plots, where individually has a measurement of 20x20m. It was established either based on dung's sign, beds, resting sites or feeding signs. If either one of these signs found, sub-plot will be established

(Adopted from Ebil (1981))