

## The Potency of Fibre Feeds and Their Needs by The Ruminants in Indonesia

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**ABSTRACT:** From the stand point of the quality of fibre feed ingredients in each provinve in Indonesia, to fulfill the maintenance requirements of ruminants animal unit (AU), the AU are sufficiently provided by the other are insufficiently supplied by certain other fibre feed ingredients. In general, from the stand point of dry-matter (DM) requirement of the AU from the fibre feeds, in the West Part of Indonesia, the situation can be described as follows: in this part the grasslands area are as large as 652,749 hectares (ha) in 1993 yielding 8,533,786 tons DM of fibre feeds for the DM needs of 3,896,706 AU/year, and the agricultural crops land are as large as 15,480,787 ha yielding 22,683,734 tons of fiber feeds DM for the DM needs of 10,357,869 AU/year. In this part there are 5,939,507 AU, so that the remaining fiber feeds DM would still be providing for another  $(3,896,706 + 10,357,869 - 5,939,507) = 8,315,068$  AU/year. In the East Part of Indonesia, the description of the

status is like the following: the grasslands areas are as large as 1,693,148 ha in 1993 yielding 6,884,546 tons of fiber feeds DM for the need of 3,143,628 AU/year and the areas of agricultural crops land are as large as 2,947,086 ha yielding 4,761,877 tons of fiber feeds DM for fulfilling the needs of 2,174,374 AU/year. In this part the AU are as much as 2,398,100 AU, so that the remaining DM fiber feeds would still be sufficient for another  $(3,143,628 + 2,174,374 - 2,398,100) = 2,919,902$  AU/year. To fulfill the maintenance requirement of the ruminants the quality of the grasslands should be improved so that their content of crude protein (CP) and total digestible nutrients (TDN) should be at least 7% and 42% respectively, and for production the contents should be at least 12% and 55%, respectively; by planting legumes in the grass-dominating pastures, and also by better management of pasture utilization.

Key Words: Indonesia, Ruminants, Fibre Feeds, Potency

### Introduction

Green feeds play an important role in the production of ruminants in the tropics, it happens also in Indonesia where the green feeds were greatly consumed by cattle, buffaloes, goats and sheep. The dry matter (DM) of feeds consumed by the ruminants ranging from 60 to 80 grams per kilogram metabolic body weight so that one animal unit (AU) of ruminant weighing 300 kgs would consume 6 kgs DM daily or 2.19 tons DM annually (Kearl, 1982; Soedomo Reksohadiprodjo, 1992).

Composition or percentage of adult, young and calves (kids) and their values of AU of cattle, buffaloes, goats and sheep could be used to calculate the AU in a population of the certain animals; namely in dairy cattle, the amount of  $AU = 0.5705 \times$  the population, in beef cattle, the  $AU = 0.4845 \times$  the

population, in buffaloes, the  $AU = 0.5069 \times$  the population, in goats, the  $AU = 0.0584 \times$  the population and in sheep, the  $AU = 0.0548 \times$  population. If each population of the ruminant animals are known, we could estimate the AU of the whole ruminant populations.

The DN yield of forage in grasslands of the provinces in Indonesia ranging from 3 to 15 tons per hectare annually. From the existing grassland in a certain province we could calculate the forage potency and from the existing ruminants populations we could calculate the animal units so that the need of the forage DM could be estimated the we could know the fulfillnes of the DM forage potency for the ruminants.

The feeds for the ruminants could also be provided by the utilization of agricultural plant by-products, namely rice straws (RS), corn stalks (CS),

cassava tops (CT), sweet potato top (SPT), peanut vines (PV) and forage and the agricultural plant by-products usually called the fibre-feeds. The DM yields of the agricultural plant by-products mentioned previously per ha annually (with the utilization- values included, are 0.75; 3.00; 2.00; 6.00; 2.10 and 2.10 tons, respectively (Anonimous, 1994).

The grasslands areas in Indonesia, in the year of 1982, 1990 and 1993 were 4,016,815 ha; 2,767,494 ha and 1,863,170 ha, respectively, and if there are no efforts to increase or at least to maintain the existing areas, the grasslands will be extinct by the year of 2004 (Anonimous, 1994).

The prediction of AU numbers and their needs of feeds coming from the grasslands and agricultural plant by-products in each province in Indonesia in the year of 1993 could be summoned as follows :

## I. The Needs for feed dry-matter

### I.A. The western part of Indonesia

#### I.A.1. Special province of Aceh

In the special province of Aceh there are 100,162 ha of grassland with the yield of feed DM of 1,502,403 tons/year providing 686,041 AU/year, whilst the crops areas are as much as 641,691 ha yielding feed DM of 938,028 tons/year to provide 428,323 AU/year. In the province there are as many as 371,700 AU, so that from the need of feed DM point of view, there still DM fibre feeds for another  $(686,041 + 428,323 = 371,700)$  AU = 742,664 AU/year.

#### I.A.2. Province of North Sumatra

In the province of North Sumatra (in 1993) there are no grasslands, so that the fibre feeds should only be provided by the agricultural plant by-products having the area of 933,507 ha yielding fibre feeds as many as 1,181,517 ton DM yearly for 539,506 AU/annually. In the province there are 248,780 AU, so the remaining fibre feeds can provide the DM for another  $(539,506 - 248,780)$  AU = 290,726 AU per year.

#### I.A.3. Province of Riau

In the province, there are 14,339 ha (in 1993) 14,339 ha grassland yielding 215,081 ton DM of fibre feeds annually sufficient for 98,211 AU per year, and the areas of agricultural crops are 207,799 ha yielding 214,987 ton DM of agricultural plant by-products providing DM fibre feeds for 98,168 AU/year. In the province there are 65,780 AU so

that the remaining DM fibre feeds are sufficient for another  $(90,211 + 98,168 - 65,780)$  AU = 130,599 AU/year.

#### I.A.4. Province of West Sumatra

In the province, there are 49,153 ha grasslands (1993) yielding 743,291 ton DM fibre feeds/year providing DM feeds for 339,402 AU/year and there are agricultural plants areas of 433,469 ha yielding 423,186 tons DM of fibre feeds for 193,236 AU. In the province (1993) there are 300,188 AU, so that the remaining fibre feeds can provide DM needs for another  $(339,402 + 193,236 - 300,188)$  AU = 232,450 AU/year.

#### I.A.5. Jambi Province

In the province, there are 14,153 ha grasslands (1993) yielding 212,298 tons DM/year providing fibre feeds DM for 96,940 AU/year and areas of agricultural crops of 274,230 ha yielding agricultural plant by-products of 285,691 tons DM/year for 130,453 AU/year. In the province (1993) there are 82,256 AU, so that the remaining DM fibre feeds are sufficient for another  $(96,940 + 130,453 - 82,256)$  AU = 145,137 AU/year.

#### I.A.6. South Sumatra Province

In the province, there are 227,780 ha of grasslands (1993) yielding 3,416,696 tons fibre feeds DM sufficient for 1,560,135 AU/year and areas of agricultural crops of 541,309 ha yielding 501,363 tons fibre feeds DM/year for 228,933 AU/year. In the province (1993) there are 298,990 AU, so that the remaining DM fibre feeds are sufficient for another  $(1,560,135 + 228,933 - 298,990)$  AU = 1,490,078 AU/year.

#### I.A.7. Bengkulu Province

In the province, there are no grasslands, and only agricultural crops areas of 120,933 ha yielding 170,406 tons DM of fibre feeds for 77,611 AU/year and in the province (1993) there are 125,134 AU so that  $(125,134 - 77,611)$  AU = 47,323 AU/year are lack of fibre feeds DM as many as 103,637 tons DM/year that should be provided by the province.

#### I.A.8. Lampung Province

In the province (1993) there are 20,293 of grasslands yielding 304,401 tons DM of fibre feeds for 138,996 AU/year and areas of agricultural crops of 956,886 ha yielding 1,792,480 tons DM of fibre feeds for 818,484 AU/year. In the province(1993) there are 202,843 AU. So that the remaining fibre

feeds are sufficient for another  $(138,996 + 818,484 - 202,843)$  AU = 754,637 AU/year.

#### **I.A.9. Special Province of Mother-City of Jakarta**

In the province there are no grasslands but still a small areas of agricultural crops (1993) as large as 7,360 ha yielding 5,950 tons DM fibre feeds for 2,717 AU/year. In the province there are 7,175 AU so that as many as  $(7,175 - 2,717)$  AU = 4,458 AU/year are still lack of fibre feeds DM annually that should be provided by the province (1993).

#### **I.A.10. West Java Province**

In the province there are 41,800 ha of grasslands yielding 629,996 tons DM of fibre feeds/year for 286,300 AU/year and areas of agricultural crops of 2,904,525 ha yielding fibre feeds of 3,480,963 tons DM for 1,589,481 AU/year. In the province there are 823,794 AU, so that the fibre feed in the province would provide another  $(286,300 + 1,589,481 - 823,794)$  AU = 1,051,987 AU/year (1993).

#### **I.A.11. Central Java Province**

In the province there are 3,813 ha of grasslands yielding 57,201 ton DM of fibre feeds/year for 26,119 AU/year and areas of agricultural crops of 2,899,750 ha yielding 4,612,961 tons DM of fibre feeds for 2,106,375 AU/year. In the province there are 1,002,403 AU, so that the fibre feeds available in the province would still provide another  $(26,119 + 2,106,375 - 1,002,403)$  AU = 1,130,091 AU/year (1993).

#### **I.A.12. Special Province of Yogyakarta**

In the province there are no grasslands and the agricultural crops areas are as large as 378,246 ha yielding 670,116 tons DM of fibre feeds for 305,116 AU/year. In the province there are 124,504 AU, so that the fibre feeds DM would still provide another  $(305,984 - 124,504)$  AU = 181,485 AU/year (1993).

#### **I.A.13. East Java Province**

In the province there are 1,126 ha of grasslands yielding 18,272 tons DM fibre feeds/year for 8,343 AU/year, and there are 3,820,607 ha of agricultural yielding 6,938,753 tons DM of fibre feeds/year for 3,168,380 AU/year. In the province there are 1,825,658 AU, so the DM of fibre feeds available would still provide for another  $(8,343 + 3,168,380 - 1,825,658)$  AU = 1,351,065 AU/year (1993).

#### **I.A.14. Bali Province**

In the province there are no grasslands, but there are agricultural crops areas as large as 286,390 ha yielding 436,566 tons of fibre feeds DM for 199,345 AU/year. In the province there are 236,134 AU, so that as many as  $(236,134 - 199,345) = 36,789$  AU/year are lack of fibre feeds as many as  $36,789 \times 2.19$  tons = 80,568 tons (1993).

#### **I.A.15. West Kalimantan Province**

In the province there no more grasslands, but there are areas 329,847 ha of agricultural crops area yielding 313,229 tons of fiber feeds DM for 143,027 AU/year. In the province there are 62,294 AU, so that the available fiber feeds DM would still be sufficient for another  $(143,027 - 62,294)$  AU = 80,733 AU/year (1993).

#### **I.A.16. Central Kalimantan Province**

There are no more grasslands in the province, but there are areas of agricultural crops of 187,671 ha yielding 167,690 tons of fiber feeds DM for 76,571 AU/year. In the province there are 16,230 AU, so that the fiber feeds DM are sufficient for another  $(76,571 - 16,230)$  AU = 60,341 AU/year (1993).

#### **I.A.17. South Kalimantan Province**

In the province there are 55,020 ha grasslands yielding 440,160 tons of fiber feeds DM for 200,986 AU/year and 128,868 ha of agricultural crops yielding 132,136 tons of fiber feeds DM for 43,728 AU/year. In the province there are 43,728 AU, so that the fiber feeds DM available in the province would still be sufficient for another  $(200,986 + 66,336 - 43,728)$  AU = 223,594 AU/year (1993).

### **I.B. Eastern Part of Indonesia**

#### **I.B.1. West Irian Province**

In the province there are 305,254 ha of grasslands yielding 1,831,524 tons of fiber feeds DM for 836,312 AU/year and areas 32,085 ha of agricultural crops yielding 65,450 tons of fiber feeds DM for 29,482 AU/year. In the province there are 27,482 AU, so that the available fiber feeds DM would still be provided for another  $(836,312 + 29,482 - 27,482)$  AU = 838,312 AU/year (1993).

#### **I.B.2. Maluku Province**

In the province there are 177,473 ha of grasslands yielding 1,064,838 tons of fiber feeds

DM for 486,227 AU/year and 39,520 ha of agricultural crops yielding 99,512 tons of fiber feeds DM for 45,439 AU/year. In the province there are 63,721 AU, so the available fiber feeds DM would still be sufficient for another  $(486,227 + 45,439 - 63,721)$  AU = 467,945 AU/year (1993).

#### I.B.3. South East Sulawesi Province

In the province there are 54,906 ha of grasslands yielding 219,624 tons of fiber feeds DM/year for 100,285 AU/year and 117,060 ha of agricultural crops yielding 193,964 tons of fiber feeds DM/year for 88,568 AU/year. In the province there are 166,967 AU, so that the fiber feeds DM available  $(100,285 + 88,568 - 166,967)$  AU = 21,886 AU/year (1993).

#### I.B.4. South Sulawesi Province

In the province there are 266,361 ha of grasslands yielding 1,065,444 tons fiber feeds DM for 486,504 AU/year and 1,209,306 ha of agricultural crops yielding 1,592,434 tons of fiber feeds DM providing the needs of 729,139 AU/year. In the province there are 931,191 AU, so that the available fiber feeds DM will provide the needs for another  $(486,504 + 729,139 - 931,191)$  AU = 282,452 AU/year (1993).

#### I.B.5. Central Sulawesi Province

In the province there are 35,654 ha of grasslands yielding 142,616 tons of fiber feeds DM for 65,121 AU/year and 197,702 ha of agricultural crops yielding 223,466 tons of fiber feeds DM to provide the needs of  $(221,159 - 65,121 - 102,040)$  AU = 53,998 AU/year

#### I.B.6. North Sulawesi Province

In the province there are no more grasslands and the fibre feeds DM are coming from the agricultural crops areas as large as 204,741 ha yielding 431,006 tons of fiber feeds/year providing the needs of 188,587 AU/year. In the province there are 141,592 AU so that the available fiber feeds DM would still be providing for the needs of another  $(188,587 - 141,592)$  AU = 46,995 AU/year.

#### I.B.7. East Timor Province

In the province there are no grasslands and the fiber feeds DM are coming from agricultural crops areas as large as 133,001 ha yielding 358,387 tons of fiber feeds DM/year providing the needs of 163,647 AU/year. In the province there are 56,735

AU so the available fiber feeds DM are still sufficient for another  $(163,647 - 56,735)$  AU = 106,912 AU/year (1993).

#### I.B.8. East Nusa Tenggara Province

In the province there are 768,006 ha of grasslands yielding 2,304,018 tons of fiber feeds DM providing the needs of 1,502,063 AU/year and 495,662 ha of agricultural crops yielding 1,071,141 tons of fiber feeds DM sufficient for fulfilling the needs of 489,106 AU/year. In the province there are 465,536 AU, so the available fiber feeds DM will still be sufficient for another  $(1,052,063 + 489,106 - 465,536)$  AU = 1,075,633 AU/year (1993).

#### I.B.9. West Nusa Tenggara Province

In the province there are 85,494 ha of grasslands yielding 256,482 tons of fiber feeds DM providing the needs of 117,115 AU/year and 518,009 ha of agricultural crops yielding of 744,517 tons of fiber feeds DM for the needs of 339,962 AU, so that the remaining available fiber feed DM would still be enough for the DM needs of another  $(117,115 + 339,962 - 323,717)$  AU = 133,360 AU/year (1993).

## II. Fiber feeds for maintenance

### A. Eastern Part of Indonesia

From the grasslands and agricultural crops areas there are fibre feeds that could be considered to fulfill the crude protein (CP) and the energy. Total digestible nutrients (TDN) needs for ruminants maintenance requirement, as follows:

	CP (%)	TDN (%)
1. grasses	7.78	56.39
2. rice straws	3.44	34.00
3. corn stalks	5.10	39.04
4. cassava tops	14.43	49.71
5. sweet potatoes	14.60	42.40
6. peanut vines	9.79	43.27
7. soybean vines	7.70	50.70

(Soedomo-Reksohadiprodjo, 1984, 1992)

For their maintenance one animal unit (ruminant) needs 6 kgs of feeds DM, 0.42 kgs CP (7%) and 2.50 kgs TDN (42%) daily (Anonimus, 1994). The feed ingredients mentioned, are grouped into 3 categories, namely below, equal and above 7% CP requirement.

Ration for maintenance then would be consisted of:

Ingredient	Part kg	Content (%)		Total (kg)	
		CP	TDN	CP	TDN
1. Grass	0.108	7.78	56.38	0.008	0.061
2. Soybean vines	0.108	7.70	50.70	0.008	0.005
3. Peanut vines	0.108	9.79	43.27	0.011	0.047
4. Rice straws	2.106	3.44	34.00	0.072	0.716
5. Corn stalks	2.106	5.10	39.04	0.107	0.822
6. Cassava tops	0.732	14.43	49.71	0.106	0.364
7. Sweet potatoes tops	0.732	14.43	62.40	0.107	0.457
6.0 kgs DM				0.411	2.522
				6.85% CP	42.03% TDN

Based on the needs of each feed ingredient for the ruminant animal unit in a province, the province can calculate the demand and potency of fibre feeds DM available in the particular province.

### Conclusion

General estimation could be stated that in 1993, in the western part of Indonesia, the fiber feeds DM requirements for the ruminants (DM needs) are as follows: the size of grasslands are 652,749 ha yielding 8,533,786 tons of fiber feeds DM/year sufficient for the DM needs of as much as 3,896,706 AU/year, whilst DM fiber feeds coming from areas of agricultural crops as large as 15,480,787 ha are 22,683,734 tons DM/year providing the needs of 10,357,869 AU/year. In these part there are 5,939,507 AU, so that the remaining DM fiber feeds would supply another  $(3,896,706 + 10,357,869 - 5,939,507) = 8,315,068$  AU/year.

In 1993, in the eastern part of Indonesia, the fiber feeds DM coming from 1,693,143 ha grasslands are 6,884,546 tons/year for the DM needs of 3,143,628 AU/year, whilst that originally from 2,947,086 ha agricultural crops are 4,761,877 tons DM/year for the DM needs of 2,174,374 AU/year. In the DM needs are 2,398,100 AU, so that the remaining DM fiber feeds would still sufficient for the DM needs of another  $(3,143,628 + 2,174,374 - 2,398,100) = 2,919,902$  AU/year.

For meeting the maintenance requirement of the ruminants, the grasslands quality should be at least to contain 7% CP and 42% TDN, and for production at least to contain 12% CP and 55% TDN.

Looking at the ration containing 7% CP and 42% TDN using the grasses and the agricultural plant-by-products, the situations are as follows:

Having ration to contain 7% CP and 42% TDN: The 1 AU of ruminants per year will need DM of 0.03942 tons of grasses; 0.70869 tons of rice straws, 0.70869 tons of corn-stalks, 0.26718 tons of cassava tops, 0.26718 tons of sweet potatoes tops, 0.03942 tons of peanut vines and 0.03942 of soy-bean vines.

In the Western Part of Indonesia there are 5,939,507 AU (1993) so the AU yearly will need : 234,135 tons of grasses, 4,209,269 tons of rice-straws, 4,209,269 tons of corn-stalks, 1,586,917 tons of cassava tops, 1,586,917 tons of sweet-potatoes tops, 234,135 tons of peanut vines and 234,135 tons of soy-bean vines, whilst the DM production of the feed ingredients are 8,533,786 tons of grass, 7,218,513 tons of rice straws, 8,455,786 tons of corn stalks, 1,964,976 tons of cassava tops, 917,554 tons of sweet potatoes tops, 1,352,936 tons of peanut vines and 2,724,965 tons of soybean vines.

In the Eastern Part of Indonesia there are 2,398,100 AU (1993) so the AU yearly will need DM of : 94,533 tons of grasses, 1,600,509 tons of rice-straws, 1,699,509 tons of corn stalks, 640,724 tons of peanut vines and 94,533 tons of soybean vines, whilst the DM production of feed ingredients are : 6,884,546 tons of grasses, 1,235,607 tons of rice straws, 2,177,008 tons of corn stalks, 463,810 tons of cassava tops, 257,211 tons of sweet potatoes tops, 165,945 tons of peanut vines and 462,300 tons of soybean vines.

Looking at the DM demand of related fiber feeds with particular quality (7% CP and 42% TDN for maintenance) and their potency (supply) one could observe the sufficiency and insufficiency the feeds so that manipulation and adjustment could be made for formulating alternative rations.

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