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PRODUCTION ASPECTS OF JAVANESE FAT TAIL SHEEP IN INDONESIA

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Contents

Foreword v

Acknowledgments vi

Program for conservation and development of Javanese Fat Tail sheep in East Java
Soetranggono 1

The development program for Javanese Fat Tail sheep in Kabupaten Pamekasan , Madura
Sadjakin, E.A. 9

Fat-tailed sheep farming in Kabupaten Sumenep, Madura
Bambang Sudiyono 13

The development of fat-tailed sheep in the Unit of Technical Service for Animals and Forages
Abdoul Aziz 19

Experiences in raising fat-tailed sheep
A. Gani 29

Research on Javanese Fat Tail sheep at Gadjah Mada University: A review
Maria Astuti 33

A short note on sheep raising in Jatiguwi, Sumber Pucung Sub-District, Malang
Bambang Sp. and Hary N. 45

The potential of fat-tailed sheep in the Province of West Nusa Tenggara
Soegeng Prasetyo 47

Research on Javanese Fat Tail (JFT) sheep in Sub-Balitnak Grati
K. Ma'sum, M.A. Yusran and D.B. Wijono 59

Production and reproductive performance of Javanese Fat Tail sheep
I-Ketut Sutama 69

Towards the conservation and improvement of the Javanese Fat Tail sheep
Luis Iniguez 79

The economic importance of Javanese Fat Tail (JFT) sheep for Javanese smallholders
T.D. Soedjana and I-Ketut Sutama 85

Conclusions and Recommendations 93

List of Participants 95

FOREWORD

Of the sheep breeds in Indonesia, the Javanese Fat Tail (JFT) is the least studied sheep population. JFT sheep are mainly distributed in East Java with an estimated 0.93 million head and are part of the intensive smallholder farming systems of the region.

There is increasing interest in local sheep as a natural resource for agricultural development and as a non-oil export commodity. Local breeds have the capacity to produce intensively and to meet special market opportunities. In this context, JFT sheep may play a key role in the present decade of promising prospective for small ruminants in Indonesia.

Present information on the productivity of JFT sheep is both scarce and disperse. Thus, it is important to compile all available information in a single document to serve as reference material. This information should include not only experimental results but also the views and plans of government agencies, private sector and farmers. Furthermore, recommendations to conserve and improve JFT, a breed that is considered an important resource for the humid and dry tropics, should be discussed and documented.

Considering this situation, the Indonesian Small Ruminant Network (ISRN), under the sponsorship of the Central Research Institute for Animal Science (CRIAS) through Balitnak and the Small Ruminant-Collaborative Research Support Program (SR-CRSP), organized this workshop to discuss available information on production and distribution of JFT sheep. These proceedings compile the contributions presented at the workshop. It is hoped that this information will not only be useful as reference material but will stimulate further developments for increasing sheep production in the country.

I-Ketut Sutama

Luis Iniguez

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PROGRAM FOR CONSERVATION AND DEVELOPMENT OF JAVANESE FAT TAIL SHEEP IN EAST JAVA

Soetranggono

Dinas Peternakan Propinsi Dati I Jawa Timur

INTRODUCTION

Although sheep production is only a secondary farming activity, it plays an important role in the traditional rural society of East Java. Its contribution to the family income is reflected in the large number of families raising sheep as a source of savings.

East Java can be considered as a traditional sheep farming region. The sheep population in 1988 consisted of 973,320 animals. In this large population, groups of fat tail (JFT) sheep can be found; however, their population in the region has not yet been quantified. As a source of breeding stock for JFT sheep, East Java has experienced an increased rate of extraction in recent years which has led to a shortage of animals in traditional breeding centres.

Development programs for JFT are very limited because priority is placed on the development of other commodities with higher economic value. However, with the increasing economic value and demand of sheep and the need for conservation of local breeds, programs for conservation and improvement of JFT have to be considered.

SHEEP IN EAST JAVA

Sheep Origin and Contribution

In East Java the sheep population consists of predominantly a fat-tailed sheep which is thought to have originated in India or West Asia. Nevertheless, JFT sheep can be now considered as an indigeneous population resulting from many centuries of natural selection which developed an animal adapted to the local ecosystems. A thin-tailed sheep with very coarse fleece and believed to have descended from crosses between local hair sheep and wooled sheep imported from South Africa and Australia is also found in East Java.

JFT sheep are also found in other islands such as Lombok, Sumbawa, Kisar and Sawu. In East Java large subpopulations are found in Kabupaten Sumenep, Situbondo, Probolinggo and Pasuruan. JFT are distributed mainly on the coastal plains with low rainfall, where pastures with short grasses abound.

During recent years, the proportion of JFT in traditional districts has declined. For instance, in Kabupaten Situbondo and Probolinggo only 30-40% of the sheep population resembles JFT; however, there are several "pockets" of JFT introduced from Sapudi Island (Madura) via the Kalbut harbour at a rate of 50 animals per week.

Districts with the potential to become a source of JFT sheep are in the eastern part of the North coast of East Java and Madura island. In the markets and villages of the western part of East Java, there are groups of JFT but the numbers are small. The population and the distribution of JFT sheep in East Java are detailed in Table 1. Table 2 is included to show the numbers of sheep and goats from 1984-1988.

Role of JFT

Source of extra income. As a secondary activity to farmers, JFT raising serves as a saving. Based on observations by Dinas Peternakan Propinsi Dati I Jawa Timur in 1983, sheep raising represents between 13.9-29.9% of the total farming income of farmers with less than 0.5 ha.

Source of manure. Manure from sheep and goats is utilized particularly for family gardens, horticultural plantations and crop estates.

Source of meat. JFT contributes to the supply of meat for human consumption. To meet the increased demand registered during Pelita (5-year development program) IV goat meat, which is in high demand, has been complemented or replaced to a large extent by sheep meat (Table 3).

Source of breeding stock. As a source of breeding stock, East Java supplies an average of 20,000 head of JFT per year.

Source of good quality leather. In 1987 (January-October) 43% of the total (US$ 4,787,460.24) from exported leather came from sheep. Goat skin, mostly used by domestic industries, is of lower quality. Sheep skin is exportable as a row material for gloves and its price is about 3 times the price of goat skin (Table 4).

Table 1. Population of minor livestock in East Java, 1988

Kabupaten/ Kotamadya	Goat	Dairy goat	Sheep	Pig
Kabupaten				
Pacitan	60,424	-	26,002	-
Ponorogo	130,391	188	20,364	414
Trenggalek	112,024	775	21,453	3,822
Tulungagung	59,458	-	12,614	28,361
Blitar	93,580	-	35,490	1,910
Kediri	87,043	-	25,328	1,083
Malang	149,845	1,826	67,543	4,04
Lumajang	46,962	1,164	33,440	2,264
Jember	56,040	26	78,642	2,806
Banyuwangi	35,159	8	33,966	11,613
Bondowoso	25,203	42	30,534	4
Situbondo	28,130	-	42,832	125
Probolinggo	59,745	264	53,930	1,937
Pasuruan	59,124	-	38,856	2,767
Sidoarjo	22,235	24	19,381	4,234
Mojokerto	51,545	-	8,480	648
Jombang	68,926	-	26,344	1,844
Nganjuk	78,345	-	47,852	2,514
Madiun	63,982	-	26,773	2,165
Magetan	61,205	-	35,714	5,502
Ngawi	82,006	964	24,349	2,184
Bojonegoro	85,479		66,451	544
Tuban	104,832	-	57,351	459
Lamongan	98,609	-	37,945	123
Gresik	61,914	94	33,223	65
Bangkalan	80,295	-	4,972	-
Sampang	40,087	-	9,166	-
Pamekasan	31,090	-	22,440	-
Sumenep	100,766	-	14,765	-
Kotamadya				
Kediri	4,501	-	1,492	-
Blitar	1,774	-	1,909	1,602
Malang	2,286	-	2,344	-
Probolinggo	5,539	-	6,791	150
Pasuruan	1,926	90	501	-
Mojokerto	850	-	323	862
Madiun	1,885	-	97	1,465
Surabaya	8,272	-	3,573	104
Total				
1988	2,061,177	5,465	973,230	85,708
1987	2,040,812	58,273	969,617	84,785
1986	2,022,609	57,630	965,658	86,427
1985	1,995,393	15,892	916,729	88,963
1984	1,962,305	16,064	958,244	87,925

Source: Dinas Peternakan Daerah Propinsi Dati I Jawa Timur (1989)

A non-oil export commodity potential. Considering the marketing possibilities for live sheep and goats in the Middle East, where fat tail animals are preferred.

SHEEP DEVELOPMENT PROGRAM

Government programs to increase sheep population and production are not as well developed as for other livestock species. During all

Table 2. Sheep and goat population in East Java, 1984-1988 (in thousands).

Species	1984	1985	1986	1987	1988
Goat	1,962	1,995	2,023	2,041	2,061
Sheep	958	917	966	970	973

Source : Dinas Peternakan Dearah Propinsi Dati I Jawa Timur (1989).

Table 3. Sheep and goat meat production in East Java, 1984-1988 (in tons)

Type of meat	1984	1985	1986	1987	1988
Goat	25,072	23,860	24,974	23,188	24,120
Sheep	5,834	4,766	4,861	6,077	7,767

Source : Dinas Peternakan Daerah Propinsi Dati I Jawa Timur (1989).

Tabel 4. Export of leather from East Java

Year	Goat			Sheep			Cattle		
	kg	US$	$/kg	kg	US$	$/kg	kg	US$	$/kg
1982	1,475,160	7,202,592	4.88	181,036	2,307,769	12.75	479,838	1,586,970	3.31
1983	1,464,626	5,713,976	3.90	234,639	2,699,293	11.50	697,810	1,889,806	2.71
1984	1,344,324	6,944,007	5.17	277,314	3,872,316	13.96	3,052,184	8,130,024	2.66
1985	1,287,411	6,997,596	5.44	247,287	3,255,947	13.17	1,982,219	7,647,845	3.86
1986	1,348,838	7,555,904	[illegible]	[illegible]	3,895,316	10.68	2,177,496	9,318,864	4.28

Source: Direktorat P.P. [illegible] (1987).

Pelita some efforts were made, mainly involving the distribution of large numbers of JFT sheep as breeding stock and their supervision.

Production of Breeding Stock

In order to develop village breeding centres based on individual farmers or on the "gaduhan" system, pure JFT males and females were distributed to farmers who were to undertake a selection program to produce better stock. From Pelita I until Pelita IV, a total of 6,814 head (1,179 males and 5,635 females) were distributed. In order to increase productivity, new breeds including Suffas, Dormas and Dormer, provided by the Presidential Aid Fund have been also introduced in the region. Production data and information on the results of these efforts are not well documented or analyzed.

In the distribution of JFT breeding stock through "gaduhan" the results were unsatisfactory because rapid sheep turnover and reproduction were not matched by the limited extension personnel for monitoring and record-keeping.

Breeding of Fat tail Sheep

In addition to village breeding centres, JFT stock is also produced in breeding centres specifically designed to produce improved stock: UPT-PPT and Garahan, Jember. UPT serves as a supplier and distributor of breeding stock, improved forages and improved feed management practices for farmers. It also provides a source of income to the local government. However, the capabilities of breeding centres as a source of germplasm and breeding stock cannot cope with the current demand. Given this situation, the inability of farmers to maintain a JFT foundation stock and indiscriminate introduction of other breeds, there is a potential danger of germplasm erosion.

Large scale investors interested in raising/breeding JFT and information on the economics and feasibility of such an enterprise including JFT sheep are not available yet. It is clear that there is a need for research to develop technology for production systems which are commercially feasible. This can trigger the interest of the private sector and result in rapid improvement and conservation of the breed. Government resources are limited and can only be oriented towards stated priorities for development. Therefore, the role of commercial enterprises is critical.

Groups of farmers possessing flocks with good production standards are now receiving an integrated supervision package from UPT. This program is new and the skill of supervisors is not yet sufficiently developed.

Feed Production

This program has introduced seeds for forages with better productivity and nutritive value, such as *Siratro, Stylosanthes*, and *Gliricidia.* Problems in the utilization of *Leucaena*, a popular legume tree, were also faced after the trees were attacked by psyllids. Introduction of highly productive and nutritive forages has been limited. The supply of grasses is insufficient to meet basic animal requirements; it is estimated that the present supply is only sufficient to cope with 40% of the feed requirements (Direktorat Jenderal Peternakan, 1990). Further development and evaluation of feed resources are needed.

Animal Health

Prevention of diseases in sheep focusses mainly on deworming by periodical treatments.

Worms and Orf have been identified as major sheep diseases in this area. Because sheep are apparently carriers of Malignant Catarrhal Fever, they are excluded from areas where cattle, in particular Bali cattle, are being raised. This has been reflected in a serious decline of the sheep population in many, otherwise traditional, sheep regions.

Farm Supervision

Through RCP (Rural Credit Program) and Inkado (Sheep and Goat Intensification) programs, management packages have been introduced to make sheep farming more efficient. These programs provide financial aid, help for marketing and effective transfer of technological information.

New sheep-raising technologies are rarely applied by farmers in contrast to what occurs with other livestock such as dairy or beef cattle and imported chickens. This situation is a consequence of poor dissemination of information because of the low profile of the extension service in regard to small ruminant production.

Population Control of the JFT Breeding Stock

Decisions and instructions from the Ministry of Agriculture and the Governor of the Province have resulted in the implementation of regulations for the shipment of JFT breeding stock outside East Java in order to prevent germplasm erosion. However, this apparently has not affected the flow of animals outside the region due to the difficulties in controlling informal and non-declared channels of transportation.

CONCLUSION

JFT sheep are indigenous to East Java and have an important role in the animal production systems of the region. JFT germplasm is subjected to a degree of erosion due to a serious population reduction. Development programs for sheep raising are minimal compared to those for other species and also are very limited by present resources (personnel and budgets). Main problems for the development of JFT sheep involve the supply and quality of breeding stock, feed and application of technologies and animal health.

Research should focus on developing demonstration units of commercial sheep flocks for smallholders as well as for large commercial companies. The demonstration of benefits can change attitudes towards sheep raising, which is now secondary for smallholder farmers, and also can attract large investors.

The market is in-place, with a considerable local demand and also a potential for export meat that has not yet been exploited. It is assumed that only by developing small commercial enterprises on different scales ranging from commercial smallholder units to a complex farming organization, conservation and improvement of JFT sheep will be successfully achieved.

There is an urgent need for research on the control of Malignant Catarrhal Fever. Clear marketing channels and potentials for export should also be explored.

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THE DEVELOPMENT PROGRAM FOR JAVANESE FAT TAIL SHEEP IN KABUPATEN PAMEKASAN, MADURA

Sadjakin E.A

Dinas Peternakan Daerah, Kabupaten Pamekasan

INTRODUCTION

Animal production systems in Indonesia are integrated with other farm activities. Cropping is usually the main system component. This integration is the result of a long process of adaptation of the system under varying environmental conditions. Management of the animal component is still traditional and the animals are basically kept as a source of manure and capital savings for family needs.

The government, through District Livestock Services, has distributed improved breeding stock and provided extension service through demonstration units and farmers discussion groups in order to intensify and improve production levels. These efforts, however, have mostly focused on animal species other than sheep that have priority in the development program of the province.

The complexity of agricultural problems especially concerning animal farming can only be solved through an integrated and continuous program. Consideration of socio-cultural aspects, economics and the regional capacity are important in the development of a program for sheep production.

THE REGION AND ITS POTENTIAL

Kabupaten (District) Pamekasan is divided into 11 Sub- districts (Kecamatan) and 189 villages. To the North it is bordered by the Java Sea, to the South by the Madura Strait, to the West by Kabupaten Sumenep and to the East by Kabupaten Sampang.

The total area of the region is 792.3 km^2, ninety four percent (74,456 ha) of which is used for agriculture. Altitude ranges from 0 to 300 m above sea level with some portions of the land hilly.

Most of the land is non irrigated (52,149 ha or 65%), houses and backyards occupy 12% (9,875 ha), rain irrigated ricefield 7% (5,803 ha), mechanized ricefield 6% (4,515 ha), simple irrigation ricefields 2% (1,400 ha) and partially exchanged ricefield 1% (726 ha) (Diperta Pangan, 1989).

There are very well defined wet and dry seasons. The wet season extends from October to May and the dry season from June to September. The average annual rainfall is 1571 mm with 131 days of rain. Average temperature ranges 27-31°C.

In 1988 the human population amounted to 596,176 people distributed in 133,342 households. Farming engages 84% of the people 5.5% are merchants, 4.5% are civil servants, private and military personnel, and 2% are fishermen.

The animal population in Kabupaten Pamekasan is presented in Table 1.

Table 1. Animal populations in Kabupaten Pamekasan (1988)

Kecamatan	Cattle	Horse	Goat	Sheep	Chicken	Duck	Goose	Rabbit
Pamekasan	7,568	0	6,527	5,630	83,664	9,634	0	0
Proppo	9,024	33	2,383	1,246	35,124	0	1,239	0
Tlanakan	11,821	79	2,491	3,509	12,637	1,427	602	53
Galis	3,251	26	1,321	1,177	15,690	3,975	0	31
Pademawu	6,930	19	2,897	2,218	37,669	3,160	0	42
Larangan	9,886	33	5,597	2,884	55,942	4,559	0	441
Palengaan	6,281	34	1,662	829	25,914	1,666	0	0
Pegantena	10,676	102	858	965	20,099	1,101	473	0
Pakong	8,893	142	3,173	1,466	30,557	3,426	0	326
Waru	15,180	186	2,272	503	26,324	1,153	0	38
Batumarma	14,929	364	2,097	1,212	19,095	1,824	0	0
Total	104,839	1,018	31,278	21,639	362,715	31,915	2,314	931

Potential for Development

Farms: general condition

As occurs in other areas, animals are components of the traditional agricultural production system. Although sheep and goats are his-

torically important animals in the region, farmers prefer to raise cattle in view of government programs supporting cattle development and the revenues obtained from their sales.

With no other feed than that based on grazing forages, the situation is critical during the dry season when farmers have to make serious choices according to raising priorities. This generates a pattern: the more head of cattle, the fewer the sheep and goats. Furthermore, the fact that sheep are carriers of malignant catarrhal fever has led to a substantial reduction in the sheep population.

Most (95%) sheep grazing occurs along the roads, riversides, dry land or in few open fields from 8 am to 5 pm. At noon, farmers provide drinking water when animals are moved to a shady area. Housing shelters or barns are very simple and are used for housing animals overnight, usually with other minor livestock. Sometimes the animals are housed in the family's kitchen.

- **Supervision and Extension Service**

In general, supervision follows the technical guidance of the Cabang Dinas Peternakan programs on the basis of land conservation. The supervision program considers the potential of the area concerning: land capacity, interest and response of farmers to innovation (for instance introduction of improved forages) and security and safety of the distributed breeding stock. The development area for sheep includes urban areas and surroundings of Kecamatan Pamekasan, Pademawu, Galis, Larangan, and Proppo. Supervision is directed toward intensification.

Direct supervision through groups or individuals and utilizing demonstration units is provided in almost every kecamatan. The distribution of breeding stock is accomplished also through farmer groups. Training of young farmers is continuously provided.

Problems Encountered

Sheep exploitation in the region is characterized by low production, which could be changed by intensifying production with more animals and more feeding inputs per flock. Whether such an intensive commercial or semi-commercial system is viable and feasible is not known and it is up to research agencies to demonstrate their

feasibility. If such a system is demonstrated to provide a substantial source of income, a revision of the extension, conservation and improvement priorities for sheep should be made.

FAT-TAILED SHEEP FARMING IN KABUPATEN SUMENEP, MADURA

Bambang Sudiyono

Dinas Peternakan Daerah, Kabupaten Sumenep

INTRODUCTION

Although the average farming system in Madura is still traditional, with an animal production component that has not yet met its production potentials in quantity and quality, this farming system has a unique role in the rural economy of Sumenep. It generates labour opportunities and increases smallholder farmers' income. Within this system, sheep production is still only a secondary activity.

Efforts in developing animal production in Sumenep District (Kabupaten) have shown some progress, evidenced by a population and production increase resulting also in an increase in the farmers' income. This was achieved by improving management practices, introducing new technologies, improving the quality of stock, post-harvest technologies, and better marketing systems.

The District Livestock Services at Sumenep has embarked on an extension program that monitors animal production improvement intending to direct the traditional farming system towards a commercial production system.

BACKGROUND

Location

Kabupaten Sumenep is located between longitudes 113° 32'54" and 116° 16'48" East and between latitudes 4° 55' and 7° 24' South.

To the North the area is bordered by the Java Sea, to the South by the Madura Strait, to the West by Kabupaten Pamekasan, and to the East by the Flores Sea. The altitude range is 0-500 m above sea level.

Administratively, Kabupaten Sumenep is divided into 25 sub-districts (kecamatan), 328 villages and 4 Kelurahan.

Geographically, Kabupaten Sumenep occupies an area of 1,980.70 km^2, consisting of a land area of 1,158.0 km^2 (58% of the total area) and a cluster of 74 islands with 822,697 km^2 (42% of the total area), some inhabited and some not. In the cluster of islands there are 8 kecamatan: Giligenting, Talango, Gayam, Nonggunong, Ra'as, Arjasa, Sapeken and Masalembu.

Climate

Kabupaten Sumenep has a tropical climate with 2 defined seasons; a wet season from October to April, and a dry season from April to October. From November to June the average monthly rainfall is greater than 60 mm, whereas during the dry critical months, from July to October, the rainfall average is less than 60 mm per month. The average annual rainfall ranges 1000-2000 mm with 1-19 days of rain per month.

Occupation

Kabupaten Sumenep is an agriculturist society. The population consists of farm owners (54%), farming labourers (15%), and fisherman, merchants and civil servants (31%).

THE POTENTIAL OF ANIMAL INDUSTRY

Successful steps towards the development of Sumenep's agricultural industry during the Five Years Development Program (Pelita) IV and the second year of Pelita V have been taken. As indicated before, this was reflected in an increase of the animal population and production, as well as a reasonable increase in the farmers' income.

The Development of Animal Population in Kabupaten Sumenep

Table 1 shows that the average increases in animal populations per year for cattle, goat and sheep were 1, 6 and 8%, respectively.

The Export of Animals from Kabupaten Sumenep

Table 2 shows that while the average of animal exports per year for cattle, buffalo and horses increased by 10, 65 and 29%, respectively, that for sheep and goats decreased by 21 and 6%, respectively. The decrease in the sheep and goat population may be due to several reasons such as unrecorded shipments to avoid taxes.

Table 1. Animal populations in Kabupaten Sumenep, 1984-1989.

Species	1984	1985	1986	1987	1988	1989
Cattle	232,937	241,602	243,533	243,533	243,634	245,646
Buffalo	5,611	6,236	6,287	6,364	6,501	6,629
Horse	4,703	3,489	3,427	3,564	3,241	3,629
Goat	96,456	96,170	95,614	100,756	99,450	102,411
Sheep	11,066	12,629	14,357	14,099	14,260	15,929
Indigenous chicken	547,214	627,375	649,144	637,356	647,068	651,401
Imported chicken	38,541	50,978	41,142	43,841	57,939	47,865
Duck	36,148	30,816	29,361	29,417	17,485	29,501
Muscovy	2,919	3,638	3,831	3,949	2,905	4,029

Table 2. Exports of animals from Kabupaten Sumenep, 1984-1989

Species	1984	1985	1986	1987	1988	1989
Cattle	5,211	6,825	6,963	5,930	6,196	7,955
Buffalo	185	677	658	543	962	1,007
Horse	111	262	118	95	90	169
Goat	433	433	315	462	332	225
Sheep	1,168	1,003	511	500	453	320

Animal Slaughtering in Kabupaten Sumenep, 1984-1989

During 1984 to 1989 numbers of cattle, goat, sheep and poultry slaughtered per year increased by 1.8, 4.5, 7.8, and 6.6%, respectively (Table 3).

Types of Sheep and Management

Two types of sheep can be found in the region: a fat-tailed sheep known as "gibas", and a thin-tailed sheep known as "domba".

Fat-tailed sheep are found mainly in the islands of Sapudi and Talango where they form a majority (50%).

As previously indicated, sheep raising follows a traditional system, based on small flocks (4-5 animals) fed on forage produced in marginal land which is grazed or cut and transported to the barn.

Table 3. Animal slaughtering in Kabupaten Sumenep, 1984-1989

Species	1984	1985	1986	1987	1988	1989
Cattle	7,460	7,095	7,217	5,930	6,715	7,719
Goat	1,729	3,000	3,371	3,076	2,009	1,612
Sheep	1,106	1,262	1,435	1,429	1,425	1,592
Poultry	213,526	200,244	230,255	231,845	265,630	289,528

Feed is supplied in the barns only at nights. During the day, the animals graze low quality grasses on the side of roads. Animals are washed frequently (1-10 times a month). Ewes are hand-mated with rams that are usually borrowed and selected for having a fatter tail. Among females selection is not so strict. Usually, prevention and cure of diseases are attempted by using traditional medicines.

In order to improve the traditional system, Cabang Dinas Peternakan Kabupaten Sumenep has implemented an extension service to provide supervision in the following production aspects:

- Stock improvement program through guidelines to select breeding stock and development of breeding centres
- Improvement of the supply and quality of animal feedstuff
- Improvement of animal health

Problems

- The flock composition is not well balanced because farmers do not follow the production recommendations regarding sex ratios and proportions of young and adult animals. This is because ownership is only limited to few animals in the barns. The remainder of animals are shared disregarding age and sex.
- Animal barns are built on soil floors that facilitate parasite transmission with only a few farmers utilizing barns raised off the ground.

CONCLUSIONS

Sheep farming in Sumenep only contributes marginally to the farmers' income and can be considered as a secondary activity. Intensive production can lead to more significant income contribution. In order for this to occur, some basic aspects need to be considered : 1) feed improvement, 2) production of improved breeding stock, and 3) the distribution of a health and management package by means of technical and extension assistance.

THE DEVELOPMENT OF FAT-TAILED SHEEP IN THE UNIT OF TECHNICAL SERVICE FOR ANIMALS AND FORAGES

Abdoel Aziz

Unit Pelaksana Teknis Ternak dan Hijauan Makanan Ternak (UPT-THMT), Garahan - Jember

HISTORICAL BACKGROUND

According to references from the Dutch administration period, UPT-THMT was originally a coffee plantation. During the Japanese occupation, the coffee plantation was turned into a fort, used for storage of weapons and ammunition, and as a shelter for Japanese soldiers.

After the Indonesian revolution around 1950, the location was used as zoological park for producing cattle, horses and goats as well as forage for feed.

In October 1978, the location was changed into a forage and goat breeding centre. Land was cultivated for planting forages and then animal facilities were built.

Around April-May 1979, UPT received some sheep (10 males each of the Suffas [S] and Dormas [D] breed of sheep) from the Presidential Program for sheep improvement, Tapos, West Java. At the same time, 225 fat-tailed and thin-tailed sheep were received from the Provincial Livestock Service of East Java .

Since 1988/1989, UPT has raised a flock of Javanese fat tail (JFT) sheep, with the following composition:

- adult males 7
- adult females 69
- young males 6
- young females 31
- male lambs 21
- female lambs 31

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JFT are to continue as a pure breed flock, and the crossbreeding flock for Dormas and Suffas will be reduced because of the poor performance of the crossbred offspring.

Position and Function of UPT

According to the Governor decree No. 3, 1986, UPT-THMT is a supporting element for Dinas Peternakan Daerah. Its technical functions are:

- to supply and distribute breeding stock and forages
- to be a breeding centre for animals and forages
- to improve technical skills for farmers to manage their farms (extension), and
- to be an income source for the local government.

PRODUCTION OUTPUTS AT THE UPT GARAHAN-JEMBER

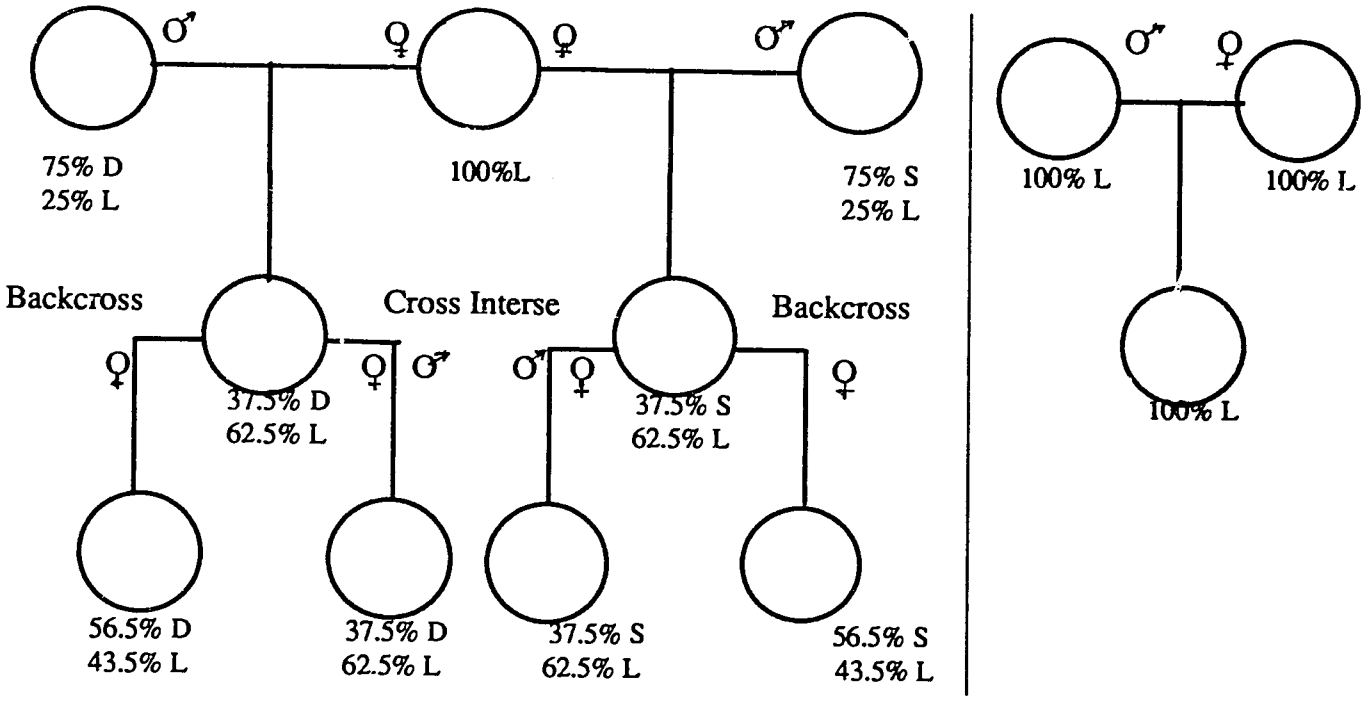
Breeding

The breeding pattern followed by UPT Garahan, Jember is shown in Figure 1. JFT sheep are kept as a pure flock whereas the crossbreeding programs intend to maintain 2 lines, one with 9/16 D 7/16 L and the second with 9/16 S and 7/16 L.

Selection is practised on ewes and rams based on their own performance or on performance of their progeny. Selected ewes are those that can perform 3 lambings in 2 years.

Lambs from outstanding ewes and rams are selected as replacement stock, considering:

- type of lambing
- weaning weight
- weight at 1 year old



Note:

D : Dorset x Merino; S : Suffolk; L : Local JFT

Figure 1. Breeding program at UPT-Garahan Jember

- weight gain
- libido
- sperm quality
- first oestrus of female lambs

Management

UPT has 18 barns each with an average size of 2.5 x 17m = 42.5 m^2 and divided in a mating pen, a pregnant pen and a lamb pen. Barns are built out of wood and are raised off the ground.

Fresh forage and concentrates are provided in the barns. The forage consists of 75% fresh grass and 25% tree legumes. The amount of forages offered per head is 15-20% body weight. Concentrate is offered in amounts of 0.7 kg for rams, 0.5 kg for ewes and 0.3 kg for young animals. Forage is given 3 times a day while concentrate only once. Water is offered ad libitum.

Ewes are group mated with a male/female ratio of 1:10. Lactating ewes are rejoined 2 months after lambing and before weaning. With this system, the lambing interval is expected to be 8 months on average.

Records are taken at mating, during pregnancy, at lambing, and at weaning. Lambing intervals, health and mortality are recorded.

Animals are regularly hoof trimmed, shorn and dip-bathed and dewormed every three months. Common diseases are intestinal parasites, diarrhea, bloating and eye problems. In 1988, Orf was detected in the flock.

Summarization of Results

The following are tables summarizing productive traits of the sheep at UPT Garahan-Jember.

Population

Table 1. Sheep population at UPT Garahan-Jember (June 1990)

Breed	Adult		Young		Lambs	
	M	F	M	F	M	F
JFT	7	69	6	31	21	31
Dormas	8	36	15	28	9	16
Suffas	7	48	12	29	19	13
Total	22	153	33	88	49	60

Birth Weight

Table 2. Average birth weight (kg) of sheep at UPT Garahan-Jember (1984-1985)

Breed	Singles		Twins	
	M	F	M	F
JFT	2.21	2.20	1.62	1.65
Dormas	2.55	2.36	1.66	1.56
Suffas	2.69	2.62	1.84	1.85

Weaning Weight

Table 3. Average weaning weight (kg) of sheep at UPT Garahan-Jember at the age of 4-5 month (1989-1990)

Breed	Weaning weight	
	Male	Female
JFT	14.5	13.0
Dormas	15.6	14.4
Suffas	15.9	14.8

Sex Ratio

Table 4. Sex ratio of lambs born in 1989-1990, UPT Garahan-Jember

Breed	Male	Female
JFT	1.0	2.3
Dormas	1.2	1.0
Suffas	1.4	1.0

Lambing Interval

Table 5. Average lambing interval (months) of ewes, UPT Garahan-Jember (1984-1985)

Breed	Lambing interval
JFT	8.0
Dormas	9.1
Suffas	11.0

Mortality

Table 6. Average mortality (%) of sheep in UPT Garahan-Jember 1989-1990)

Breed	Adult	Young	Lambs
JFT	3.90	4.00	21.20
Dormas	2.20	2.43	23.13
Suffas	2.67	2.80	25.20

Type of Lambings

Table 7. Litter size distribution (%) in UPT Garahan-Jember (1984-1985)

Breed	Litter size		
	1	2	3
JFT	65.1	30.3	4.6
Dormas	59.1	49.9	0
Suffas	73.5	26.5	0

Daily Weight Gain

Table 8. Daily weight gain of sheep in UPT Garahan-Jember (1989-1990)

Breed	Weight gain (g/day)	
	Male	Female
JFT	81	72
Dormas	87	82
Suffas	88	81

Distribution of Breeding Stock

Offspring produced at UPT Garahan have been distributed in East Java under the Centre's supervision. The distributed breeding stock were offspring of Dormas x Local or Suffas x Local sheep. Offspring of pure JFT have not yet been distributed. The numbers of distributed animals are shown in Table 9.

Table 9. Distribution of breeding stock from UPT Garahan-Jember (1980-1990)

Kabupaten/ Kodya	Females	Males	Years	Females	Males
Jember	172	125	1980-81	77	0
Banyuwangi	10	11	1981-82	68	0
Bondowoso	15	11	1982-83	58	34
Situbondo	14	0	1983-84	94	60
Malang	32	4	1984-85	89	39
Lumajang	8	0	1985-86	107	51
Pasuruan	32	20	1986-87	38	85
Probolingo	16	5	1987-88	81	82
Surabaya	17	31	1988-89	18	34
Sidoarjo	8	7	1989-90	30	0
Mojokerto	17	5			
Pamekasan	0	0			
Bangalan	0	0			
Sampang	0	0			
Sumenep	0	0			
Bojonegoro	52	0			
Tuban	5	0			
Lamongan	5	0			
Blitar	20	1			
T. Agung	4	0			
Trenggalek	4	8			
Nganjuk	25	20			
Jombang	57	30			
Madiun	27	6			
Ngawi	29	25			
Magetan	14	40			
Ponorogo	48	35			
Pacitan	29	1			
Totals	660	385			

CONCLUSIONS

UPT Garahan-Jember supports the conservation and development of JFT in East Java. UPT Garahan-Jember has the potential to maintain the pure JFT flock started recently, and expects to assist smallholder farmers by providing them with superior breeding stock of JFT sheep. Information and guidelines from research scientists are needed to increase the quality of management in the UPT breeding centre.

EXPERIENCES IN RAISING FAT-TAILED SHEEP

A. Gani

Dusun Kayumas, Desa Jeding, Kecamatan Arjasa Kabupaten Situbondo, Jawa Timur

BACKGROUND

Location

Kayumas is one of several sub villages (dusun) in the village (desa) of Jeding, Kecamatan Arjasa, Kabupaten Situbondo, East Java. To the South this area is bordered by Kabupaten Bondowoso; to the North by desa Bayenman, Kecamatan Arjasa; to the West by desa Kedunglo, Kecamatan Arjasa; and to the East by desa Sopet, Kecamatan Jangkar. Kayumas is located in the eastern part of Kabupaten Situbondo, and known as the driest region of Java.

Kayumas is mountainous with an altitude between 700-1000 m above sea level. The wet season is between November to April with an annual rainfall of 71 mm (in 1988). The temperature is 29-30°C at noon and 22-24°C at night.

Occupation

Most of the population in Kayumas consists of dryland farmers, laborers at coffee plantations, some merchants and animal farmers. The main commodities produced in the area are coffee, tobacco and cassava. The livestock population consists of cattle, sheep, goats and chickens. The main breed of sheep is the Javanese fat tail (JFT).

DESCRIPTION OF A JFT SHEEP FARM

Management

In 1981 the author started a JFT flock with 35 ewes and 3 rams acquired locally and from other areas. In 4 years the population increased to 300 animals. Animal barns were built out of Leucaena trees, bamboo and rooftiles. The size depended on the number and age of animals. The barns were separated into 4 pens to allocate males,

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lambing ewes, other groups of sheep including one pen for the sick. The composition of the flock and pen allocation followed the physiological status and age of animals (as recommended by Dinas Peternakan):

- adult males (12 month old) ..... 1.2 m^2/head
- adult females (12 month old) ..... 1.0 m^2/head
- lactating ewes with 2 lambs ..... 2.0 m^2/head
- young animals (7-12 month old) ..... 0.75 m^2/head
- weaned lambs (3-7 month old) ..... 0.5 m^2/head

Feeding was mainly based on Leucaena leaves and grasses, while concentrate was rarely offered. Before Leucaena was attacked by psyllids, we hardly observed any disease problem in the flock. After the psyllids attack at the end of 1985, due to a substantial reduction in forage supply, disease problems were evident and more acute.

Important symptoms usually leading to death were bloat and diarrhoea. We did not know the causes of these symptoms.

Reproduction performance

Our records indicated a number of 1 service per conception and an interval between pregnancies of 203 days. Lamb survival was 99% and the average number of lambs born 2. Birth weight ranged 0.9-1.2 kg.

After the drop in forage supply due to the psyllid attack on Leucaena, animal body weight and appetite declined, resulting in lower birth weights and lower percentage of live lambs.

Research Problems

Given the agroecological conditions of the region and the problems caused by the attack of psyllid on Leucaena, efforts should have been made to provide new strategies and forage species to compensate for the shortage of forage, the main constraint to the production.

In our judgement the following are priorities for research consideration:

- Information is needed on new tree legumes such as Glyricidia in

tree cropping associations and as substitutes of Leucaena as an animal fodder.

- Because intensification of food cropping in the wet season seriously limitates the potential of grazing areas in the region, new alternatives based on tree legumes and use of local by-products should be studied.
- There are some marketing difficulties in Kabupaten Situbondo. There are no price standards and the control of marketing is under middlemen. Ways to market with more benefits for the producer should be investigated.

The Integrated Coffee Plantation and Small Ruminant Production System

Own experience

Coffee is the main crop in the region. Coffee grains need the shade of legume trees such as Leucaena. Furthermore, leaves of leucaena can be used to feed small ruminants. Native grasses usually grow under coffee trees and can also be used to feed animals.

Our farm manages an integrated system in which grasses and Leucaena leaves are used as animal feed. Manure produced by the flock is returned to fertilize the coffee trees resulting in an efficient integration and increased income.

The integrated system worked with no problems until the attack of psyllid on the Leucaena trees. This phased the system out of equilibrium with adverse results for the plantation and the animal population.

Commercial coffee plantation

In the highland of Situbondo is located PTP, a government owned coffee plantation which was originally a Dutch company. An interesting example of integration of a crop and animal production systems was developed in this plantation.

Plantation workers live in an area defined by the company and were allowed each to build a barn and raise a given number of sheep (5-10 heads). An area in the coffee plantation was assigned to each worker for weeding and fertilization . Weeds (forage) are collected from the area as well as an amount of Leucaena leaves which are brought to the

barn for the farmers to feed their animals. The farmers in return agreed to fertilize the assigned trees with the manure produced by their animals.

With the advent of the Leucaena crisis this interaction again was disrupted. Farmers are now raising fewer animals or shifting to raise 1 or 2 head of cattle.

CONCLUSIONS

Our experience with JFT sheep has been encouraging. With the utilization of good quality forages including Leucaena leaves, increased production levels can be maintained with higher body weights, minimal health problems and higher lamb crops.

It is expected that research will find new alternatives to provide improved feeding, particularly to substitute the utilization of Leucaena leaves, in view of the phytopathological problem presented to this important legume tree.

RESEARCH ON JAVANESE FAT TAIL SHEEP AT GADJAH MADA UNIVERSITY: A REVIEW

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INTRODUCTION

Among the sheep breeds of Indonesia, the Javanese Fat Tail sheep (JFT) is the second largest sheep population. Most of the sheep in East Java are fat-tailed, while in Central and West Java they are thin-tailed. JFT and JTT crosses represent 20 to 50% of the sheep population of Central Java.

Although the value of JFT sheep as a genetic resource in Indonesia and their contribution to the national animal production are well recognized; their characteristics, potential and productivity are not yet well documented. For the future development, improvement and conservation of JFT sheep, information from field observations and research results is urgently needed. The available information will provide better knowledge for further planning concerning research and production programs.

The purpose of this paper is to review research on JFT sheep. To avoid the unnecessary duplication with other reviewers, only research conducted at Gadjah Mada University or by Gadjah Mada personnel was reviewed.

BREED CHARACTERISTICS

Most of the JFT sheep are white in color, but some have brown patches. Unlike JTT sheep, JFT rams are mostly polled, and only a few of them have small horns. The ewes are polled. The animals have medium size and semi-looped ears, have a coarse fleece and in many cases a hair coat. They have long and fat tails, with the tails reaching the hock and narrow at the tip.

The type of the tail is the important breed characteristic that distinguishes the breed from the JTT sheep. The JFT crosses with JTT sheep have a long and fat tail, but to some extent the size differs from the size

of pure fat tail sheep. Because of this, differentiating pure fat tail sheep from their crosses is not straightforward. In addition, environmental factors such as nutrition are known to affect the size of the tail.

BODY MEASUREMENTS

Rustomo (1981) from his studies with JFT sheep reported the following body measurements in Table 1.

Table 1. Body measurements of JFT sheep

Age (month)	Weight (kg)		Body length (cm)		Heart girth(cm)	
	rams	ewes	rams	ewes	rams	ewes
6-12	20.07±0.96	17.24±0.86	55.52	53.37	59.51	57.69
30-36	30.84±4.50	24.75±0.75	61.49	58.34	70.16	65.37

Source : Rustomo (1981).

Suwarno (1984) measured characteristics of fat tail crosses from field observations and compared the body measurements of JTT sheep with the JFT sheep. His results are condensed in Table 2.

Table 2. Average body measurements of JTT sheep and JFT crosses at post-weaning age

Trait	JTT		JFT cross	
	Female	Male	Female	Male
Height of wither (cm)	46.05	44.78	46.26	45.54
Heart girth (cm)	53.00	50.67	51.62	51.57
Body length (cm)	39.12	37.19	40.99	39.17
Width of hip (cm)	7.44	7.31	8.49	8.25
Length of tail (cm)	17.50	16.44	19.59	19.82
Width of tail (cm)	4.64	4.33	4.71	4.64
Body weight (kg)	10.42	9.78	10.17	10.41

Source : Suwarno (1984).

The average body measurements for ewes at first lambing were also reported and the figures are listed in Table 3.

Table 3 suggests that the average body weight of JFT crosses at first lambing is higher than the JTT but is lower than the average obtained in JFT (24.63 kg) by Suryapratama (1980).

Table 3. Average body measurements of JTT sheep and JFT crossbred ewes at first lambing

Trait	JTT	JFT crosses
Height of wither (cm)	56.12	55.71
Heart girth (cm)	64.87	64.83
Body length (cm)	48.93	50.08
Width of hip (cm)	10.19	12.00
Length of tail (cm)	20.15	21.94
Width of tail (cm)	4.89	7.22
Body weight (kg)	19.67	22.83

Source : Suwarno (1984).

Body measurements at different ages in JFT sheep were also reported by Wijono (1989). The averages for body weight, body length and height in young animals (age 7-12 months) were 10.73 ± 2.52 kg, 45.42 ± 3.52 cm and 42.35 ± 4.32 cm, respectively, while for older animals (12-18 month) were 17.27 ± 4.01 kg, 51.70 ± 5.19 cm and 46.92 ± 4.17 cm, respectively.

Astuti et al. (1984) reported that tail length and width of JFT crosses were 19-30 and 5-11 cm in females, respectively, and 18-31 and 6-11 cm in males, respectively In JTT the ranges were 12-18 cm and 3-5 cm in females and 11-22 cm and 2-6 cm in males.

The studies reported above show that JFT sheep had larger body weight and tail length than JTT and JFT crosses.

PRODUCTION PERFORMANCE

Suryapratama (1980) reported average birth weight and weaning weight (3 months of age) for JFT sheep and in crossbred JFT x Dormer and JFT x Suffas sheep (Table 4).

Darmowijono (1980) reported the average weight at puberty for JFT and crosses with Dormer and Suffas. Averages for JFT in this study were somewhat higher than those reported by Sirait (1979) as shown

in Table 5.

Table 4. Birth weight, weaning weight and daily gain in JFT x Dormer and JFT x Suffas

	Weight		
	At birth (kg)	At weaning (kg)	Daily gain (g)
JFT	1.92 ± 0.13	6.92 ± 0.18	47.7 ± 6
JFT x Dormer	2.31 ± 0.28	9.94 ± 0.27	77.6 ± 9
JFT x Suffas	1.97 ± 0.20	8.85 ± 0.22	76.2 ± 8

Source: Suryapratama (1980).

Table 5. Weight at puberty of JFT and JFT crosses

	Weight at puberty (kg)			
	Males[1]	Females[1]	Males[2]	Females[2]
JFT	21.9	21.1	16.1	13.8
JFT x Dormer	24.9	21.9	-	-
JFT x Suffas	21.0	18.9	-	-

[1] Darmowijono (1980)
[2] Sirait (1979)

In Sirait's (1979) observations, weight at puberty ranged 12.1-24.7 kg in males and 11.9-17.5 kg in females.

Sirait (1979) and Darmowijono (1980) also reported average daily gains of JFT and crossbred sheep. Figures from these reports were included in Table 6.

Wijono (1989) studied the effect of crossbreeding on birth weight, weight at weaning, at 7 months and at 10 months in JFT crossed with Dormas and Suffas sheep. In all cases crossbred animals were heavier than JFT (Table 7).

Table 6. Average daily weight gains of JFT and JFT crosses

	Daily gains (g)			
	Males[1]	Females[1]	Males[2]	Females[2]
JFT	61.2±17.1	45.1±16.9	86.9 ± 4	81 ± 4
JFT x Dormer			105.0 ±10	106.5 ±10
JFT x Suffas			102.0 ± 4	99.8 ± 4

[1] Sirait (1979)
[2] Darmowijono (1980)

Table 7. Average birth weight, weaning weight, 7-month and 10- month weight of JFT sheep and crosses of JFT with Dormas and Suffas sheep

Weights (kg) at	JFT crosses with		
	JFT	Dormas	Suffas
Birth	2.40 ± 0.06	2.88 ± 0.01	2.79 ± 0.02
Weaning	7.21 ± 0.14	8.00 ± 0.14	8.24 ± 0.28
7 months	9.65 ± 0.17	11.73 ± 0.20	12.66 ± 0.31
10 months	12.70 ± 0.30	14.90 ± 0.41	16.50 ± 0.48

Source : Wijono (1989).

Analysis of heritability suggested that non-genetic variation decreased with age with consequent increase in the estimates of heritability (Table 8).

Table 8. Heritability estimates of birth, weaning, 7-month and 10 -month weights

Weights at	JFT crosses with		
	JFT	Dormas	Suffas
Birth	0.06 ± 0.08	0.12 ± 0.08	0.06 ± 0.10
Weaning	0.26 ± 0.14	0.27 ± 0.17	0.23 ± 0.17
7 months	0.29 ± 0.24	0.33 ± 0.24	0.40 ± 0.23
10 months	0.48 ± 0.29	0.38 ± 0.31	0.59 ± 0.28

Source: Wijono (1989).

The reports on phenotypic and genetic correlations in Wijono's (1989) study are presented in Table 9.

Table 9. Phenotypic and genetic correlations between weights of lambs from birth to 10 months of age

Breed	Correlations	
	Phenotypic	Genetic
JFT :		
WW - WB	0.20	0.46
WW - W7	0.70	0.15
WW - W10	0.44	0.33
Dormas x JFT :		
WW - WB	0.23	0.69
WW - W7	0.66	0.76
WW - W10	0.71	0.14
Suffas x JFT :		
WW - WB	0.25	0.49
WW - W7	0.69	0.62
WW - W10	0.63	0.76

Source : Wijono (1989)
WW : Weaning Weight ; WB : Weight at Birth
W7 : Weight at 7-month old ; W10 : Weight at 10-month old

Santhiarsa (1981) reported birth weights, weaning weights and daily gains from birth to weaning of an F_2 population. The F_2's were the progeny of Dormer and Suffas crossed by JFT. Table 10 summarizes Santhiarsa's results along with data of F_1's (Suryapratama, 1980) as comparison. In the F_2's the average birth weight, weaning weight and average daily gain were lower than in the F_1's. The Fat Tail sheep recorded better averages probably because of its better adaptation.

Body weights at slaughter age (12 months) in JFT, Dormer and Suffas crosses were 22.96 ± 0.55, 21.79 ± 0.55, 28.82 ± 1.29 kg, respectively; while the carcass percentages 38.38 ± 1.21%, 44.88 ± 2.30% and 42.33 ± 1.53%, respectively (Inspektorat Dinas Peternakan Propinsi Dati I Jawa Tengah dan Fakultas Peternakan UGM, 1980). The carcass yield of JFT was lower than that of crossbreds and comparable to yields of the Javanese Thin Tail (Komarudin, 1990).

Table 10. Average of birth weight, weaning weight and average daily gain from birth to weaning in F_1 and F_2 crossbreds

Trait		F_1 [1]	F_2 [2]
Birth weight (kg)	JFT	1.92 ± 0.13	2.15 ± 0.12
	Dormer X	2.31 ± 0.28	2.26 ± 0.16
	Suffas X	1.97 ± 0.24	1.66 ± 0.27
Weaning weight (kg)	JFT	6.92 ± 0.18	9.34 ± 0.53
	Dormer X	9.94 ± 0.27	8.80 ± 0.96
	Suffas X	8.85 ± 0.68	6.98 ± 1.15
Daily weight gain (g)	JFT	47.70 ± 6.00	67.90 ± 7.00
	Dormer X	77.60 ± 9.00	63.90 ± 9.00
	Suffas X	76.20 ± 8.00	50.30 ± 10.00

[1] Suryapratama (1980) ; [2] Santhiarsa (1981)

REPRODUCTION PERFORMANCE

JFT males reach puberty earlier than females. The average puberty ages for JFT, Dormer crosses and Suffas crosses (Darmowijono, 1980) were 235, 208 and 223 d, respectively in males, while in females 293, 216 and 230 d, respectively. Lower averages (198 d in males and 215 d in females) in JFT sheep were reported by Sirait (1979).

Services per conception in JFT sheep were similar to their crosses with Dormas and Suffas (1.25, 1.0 and 1.2, respectively; Inspektorat Dinas Peternakan Propinsi Dati I Jawa Tengah dan Fakultas Peternakan UGM, 1980).

According to Wardhani (1980) the lengths of gestation period for JFT , Dormer and Suffas crosses were 150 d, 147 d and 146 d, respectively. Further reports suggested that twins had shorter gestation periods than singles (148 and 151 d, respectively).

Post-partum oestrus (Ismaya, 1979) was observed in two different seasons (dry, ±120.5 mm, and rainy, ±277.9 mm) and ages (1-3 years and 3-5 years old). The report indicated that age, rainfall and interaction between the two effects did not contribute to changes in the length of post-partum oestrus. The average post-partum oestrus was 48.6 ± 5.1 d.

NUTRITION

Aryogi (1988) conducted an experiment on utilization of three rations in Fat Tail grades : 1) elephant grass and rice bran, 2) ammoniated sugar cane tops (basal ration) and rice bran concentrate and 3) ammoniated sugar cane top (basal ration) and rice bran concentrate mixed with molasses (1:1 ratio). The sugar cane tops were ammoniated with 4% dry matter urea and ensiled for one week. Crude protein consumption figures per metabolic live weight differed significantly and were 12.43, 14.78 and 14.82 g/day respectively for the three treatments. No differences were found for dry matter consumption, nitrogen free extract consumption, total digestible nutrient and average daily gain. Sulistyowati (1988) compared three dietary treatments also in Fat Tail grades: 1) elephant grass with rice bran, 2) elephant grass with rice bran and molasses and 3) ammoniated sugar cane top with rice bran and molasses. No differences were observed on crude protein consumption, total digestible nutrients, average daily gain, nitrogen free extract consumption and dry matter consumption.

Pratiwi (1989) conducted a trial utilizing urea ammoniated sugar cane tops to replace elephant grass, and molasses to replace rice bran. With the sole exception of nitrogen-free extract, other variables such as crude protein consumption, total digestible nutrient, dry matter consumption and live weight gain did not differ between treatments. It was concluded that urea ammoniated sugar cane tops (4% dry matter urea) can be used to replace elephant grass in sheep rations, while molasses (15% dry matter) can be substituted for rice bran in rations with elephant grass as the basal feed.

DISEASE, PARASITES AND MORTALITY

Common diseases observed in JFT sheep are diarrhoea, pneumonia, eye disease, and a viral disease known as "bengoren". Common internal parasites are Oesophagostomum, Schistosoma, Coccidia, Moniezia, Haemonchus, Strongyloides, Fasciola and Paraphistomum. Lamb mortality from birth to weaning was reported to be 7.86% (Inspektorat Dinas Peternakan Propinsi Dati I Jawa Tengah dan Fakultas Peternakan UGM, 1978).

CONCLUSIONS

The results of the experiments reviewed indicate a wide variation of body measurements and performance of production and reproduction in JFT and their crosses. Part of the variation is of genetic origin and partly environmentally influenced. Assessment of genetic and non-genetic factors, and their interactions, are needed to reveal the productivity potential of the breed.

Crossing JFT with JTT to improve performance of JTT is still questionable, as there is a lack of research to support the view that the offspring are better than JTT or JFT. At this point there is a need for assessing productivity of JFT and JTT and crosses under the same management level and care. Furthermore, further breed characterization of JFT is needed.

Research results have indicated that crossing JFT with Dormer or Suffas improved performance of its offspring. Further research is needed, in particular involving important reproductive traits and long-term productivity before decisions on breeding programs are made.

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A SHORT NOTE ON SHEEP RAISING IN JATIGUWI, SUMBER PUCUNG SUB-DISTRICT, MALANG

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In the Sub-district of Sumberpucung there are about 2,079 sheep, mostly (60%) consisting of Javanese fat tail (JFT) (Dinas Peternakan Kabupaten Malang, 1990). The largest concentration of JFT could be found in Jatiguwi village. In this region, sheep are mainly raised by smallholder farmers, following the traditional husbandry system as an additional source of income.

To characterize some aspects of production performance in villages, observations on 62 JFT in 15 farmers in Jatiguwi were obtained and the results summarized below.

Body weights of younger (with no incissor teeth) ewes and rams averaged 18.2±2.9 kg and 18.8±3.6 kg, respectively. Adult females with at least 1 pair of incissors averaged 29.8±8.5 kg (n=20). These values were higher than those previously reported (Mardianto, 1986; Kuncoro, 1986; Ermaniyah, 1987) possibly because of improved feed and management.

Animals were fed on native grasses and supplemented with soybean peeling (a by-product of the tempe industry) and, occasionally, with leaves of wild sunflowers. The results of the analysis of feedstuffs used at Jatiguwi are shown in Table 1.

Tabel 1. Nutritive contents of local feedstuffs

Feedstuff	Nutritive content (%)					
	Dry matter	Crude protein	Fat	Crude fiber	NFE	Ash
Natural grass	30.22	9.73	1.73	29.13	31.90	17.50
Wild sunflower leaves	70.70	22.19	2.45	10.05	37.30	11.99
Soybean peeling	15.58	17.19	4.31	26.81	45.46	6.23

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The average litter size in Jatiguwi was about 2 lambs. This estimate was slightly higher than that of Aprilianto (1984). The estimated lambing interval was 6-7 months. Weaning occured naturally.

Due to scarcity of rams in the region, borrowing rams for mating is a common practice among farmers. The animals grazed during the day and were housed during the night. Scabies and bloat were two common diseases.

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THE POTENTIAL OF FAT-TAILED SHEEP IN THE PROVINCE OF WEST NUSA TENGGARA

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INTRODUCTION

The province of Nusa Tenggara Barat (NTB) is located between longitude 115° 46' - 119° 05' East and latitude 8° 5' - 9° 5' South. To the North the province is bordered by the Java Sea, to the East by the Sape Strait, to the South by the Indian Ocean, and to the West by the Lombok Strait.

With an area of 20,153.15 km^2 NTB includes the islands of Lombok and Sumbawa in addition to other smaller islands. Lombok is 4,738.7 km^2, while Sumbawa 15,414.45 km^2. Lombok is very hilly in the North, moderately in the South and flat in the central part. Sumbawa is mostly hilly.

NTB is tropical with an annual rainfall between 1000 and 2000 mm. It rains more in Kabupaten (district) Lombok Barat (West) than in the East. Kabupaten Bima has the lowest rainfall in the region. The rainy season lasts for 3-6 months. The average temperature is 24.4 - 26.9°C and the average humidity 77-84%.

Administratively, NTB is divided into 6 Kabupatens. Kabupaten Lombok Barat (West), Lombok Tengah (Central), Lombok Timur (East), Sumbawa, Dompu and Bima. There are 59 sub-districts (Kecamatan) with 564 villages. Kabupaten Sumbawa has the largest area (42% of the total area), with 14 kecamatan and 119 villages.

The population of NTB in 1988 was 3,137,445 with a rate of increase of 2.26% per year. The difference in population density between Lombok and Sumbawa is large; while in Lombok the density was 462 persons per km^2, in Sumbawa it was only 57. In Lombok live 71% of the total population of NTB. The infant mortality rate is 160 per 1000 births and life expectancy 48 years.

A total of 238,995 ha are considered suitable for grazing. The vegetation consists of native grasses (71,426 ha), shrubs (147,205 ha) and alang-alang (*Imperata* sp) (20,364 ha).

Most (77%) of the grazing area is located in Sumbawa (Table 1). Livestock in NTB include: cattle, buffaloes, horses, goats, sheep and pigs. Cattle are predominant (68.9%) in Lombok, while buffaloes are predominant in Sumbawa (Table 2). Large ruminants are more numerous than small ruminants (Table 2).

Table 1. Area of grazing land in NTB in 1988 (in ha)

Kabupaten	Shrubs	Alang-alang	Native grass
Lombok Barat	3,964	8,448	4,914
Lombok Tengah	12,215	2,115	4,754
Lombok Timur	6,631	760	11,639
Sumbawa	54,453	1,200	12,147
Dompu	31,094	769	12,295
Bima	38,848	7,063	25,677

Source: Dinas Peternakan NTB.

SHEEP IN WEST NUSA TENGGARA

Two types of sheep can be found in NTB: a thin-tailed (TT) and a fat-tailed sheep (FT). Data on the number of each type are not yet available, but FT sheep are slightly less numerous than thin-tailed sheep. This paper presents general information on both types and detailed technical information on FT.

Information on the history of sheep in NTB is not available. It is believed that sheep were brought from Java in 1800.

There are no specific areas for FT and for TT sheep, therefore crossbreeding cannot be avoided or controlled and nothing can be said about the breeding composition of the crossbreds. Moreover, the variation in the type of tail is possibly the variation of a composite population.

The FT sheep in NTB has a larger tail than thin-tailed sheep and the tip of the tail curves upward. The adult male has a mane ("surai") hanging from the breast. The colour is predominantly white with a few animals having brown spots.

The role of sheep in the region, like the role of other small livestock, is as capital saving. Sheep are sold when a farmer needs

cash to meet urgent needs such as purchase of seeds, paying school fees, etc.

In several kecamatan, such as in South Lombok, Mangkung, Praya Barat, Sengkol and Puyut the manure of small ruminants is used to fertilize water melon plantations.

Table 2. Livestock distribution in NTB in 1988 (in animal units)

Kabupaten	Cattle	Buffalo	Horse	Goat	Sheep	Pig
Bima	32,189	49,314	11,694	8,995	696	0
Dompu	5,451	19,470	3,383	3,239	0	0
Sumbawa	32,904	90,900	26,797	3,937	391	258
Sumbawa	70,544	159,684	41,874	16,171	1,087	258
island(%)	(24.36)	(55.14)	(14.45)	(5.59)	(0.37)	(0.09)
Lombok Timur	67,106	10,473	4,875	10,630	1,671	0
Lombok Tengah	62,851	24,864	2,100	6,673	2,010	157
Lombok Barat	60,204	6,561	5,235	3,851	591	6,017
Lombok	190,161	41,898	12,210	21,154	4,272	6,074
island(%)	(68.93)	(15.19)	(4.43)	(7.67)	(1.55)	(2.23)
Total	260,705	201,583	54,084	37,084	5,359	6.432
(%)	(46.10)	(35.65)	(9.56)	(6.60)	(0.95)	(1.14)

Source: Dinas Peternakan NTB.

Sheep Distribution in NTB

Sheep in NTB consisted of 5,359 animal units. This amount is relatively small, only 0.95% of the total number of animals. From this amount 72% was in Lombok and the remaining 28% in Sumbawa. The largest population is found in Kabupaten Lombok Tengah (37%). In Sumbawa, there are fewer sheep and in one kabupaten, Dompu, there are none (Table 2). Furthermore, sheep only exist in villages with no or few cattle. Sheep tend to coexist with buffaloes (Table 4).

There were, in 1988, 31% males and 69% females. The age composition of the flock was 13% lambs, 10% young and 77% adult animals (Table 3).

Table 3. Sheep composition based on sex and age in NTB (1988)

Kabupaten	Lambs			Young			Adult		
	M	F	Total	M	F	Total	M	F	Total
Bima	327	423	750	250	326	576	1,191	3,218	4,477
Dompu	0	0	0	0	0	0	0	0	0
Sumbawa	183	237	420	140	184	324	668	1,843	2,511
Sumbawa island	510	660	1,170	390	510	900	1,859	5,061	6,988
Lombok Timur	784	1,015	1,799	599	784	1,383	2,859	7,884	10,743
Lombok Tengah	943	1,221	2,164	720	943	1,663	3,438	9,481	12,919
Lombok Barat	277	395	636	212	277	489	1,010	2,787	3,797
Lombok island	2,004	2,595	4,599	1,531	2,004	3,535	7,307	20,152	27,459
Total	2,514	3,255	5,769	1,920	2,514	4,435	9,166	25,281	34,447
(%)	(5.6)	(7.3)	(12.9)	(4.3)	(5.6)	(9.9)	(20.5)	(56.6)	(77.2)

Source: Dinas Peternakan NTB.

Table 5 shows the low population growth that occurred (0.20% per year) during Pelita (5-year Development Program) IV (1984-1988). The population increased only in Kabupaten Lombok Timur and Lombok Barat. In other kabupaten the sheep population decreased, with the largest decrease occurring in Kabupaten Sumbawa. This reduction was the result of an NTB government program to increase the population of Bali cattle in detriment of the sheep population which is the carrier of malignant catarrhal fever (MCF) that kills cattle.

Sheep Raising

Most sheep are grazed but some are raised in total confinement. There are two grazing systems. In one, the animals graze from 9 am till 4 pm. In the second, the animals graze from 8 to 12.30, when they are brought to the barns and then are allowed to graze again at about 3 pm until sunset. In the barns, some farmers provide additional feed

consisting of grasses or kitchen residuals. Water is limited usually to one bucket for several animals. About 2 tablespoons of salt are added to drinking water. In the wet season the grazing time is limited to dry periods. Farmers should cut forage for feeding in the barn in the event of rain.

Table 4. Animal population in Kecamatan Pringgabaya, Kabupaten Lombok Timur, July 1990

Village	Cattle	Buffalo	Goat	Sheep
Pringgabaya	159	549	1,556	2,030
Labuhan Lombok	208	115	3,398	3,262
Perigi	984	34	719	-
Sapit	702	-	15	-
Swela	744	-	251	-
Suntelangu	1,090	-	144	-
Selaparang	823	-	877	-
Ketangga	817	522	-	
Batuyang	134	145	316	472
Pohgading	91	146	353	141
Apitaik	389	-	536	500
Bagik Papan	153	40	506	126
Kerumut	389	-	536	99

Source: Dinas Peternakan Kecamatan Pringgabaya.

Sheep in total confinement are cut and carry fed. Few animals per farmer can be kept under this system because of the labour used for cutting forage restrictions. Hamidi (1984) found that the average dry matter consumption of native grasses fed to FT sheep in Kabupaten Lombok Barat was 1,373 g/head/d. Based on this estimate it was calculated that one person can only supply forage to a maximum of 5 animals.

Males are kept together with females inside barns or while grazing. Mating usually occurs naturally during grazing where animals from different farmers roam together. Rams are occasionally shared among farmers.

Table 5. The sheep population in NTB during Pelita IV

Kabupaten	1984	1985	1986	1987	1988	Avg. increase per year (%) Real	Target
Bima	6,303	6,874	6,572	5,309	5,803	-1.32	0.0
Dompu	0	0	0	0	0	0.00	0.0
Sumbawa	4,559	3,431	3,397	2,959	3,255	-7.16	0.0
Sumbawa island	10,861	10,305	9,969	8,268	9,058	-3.97	0.0
Lombok Timur	10,453	13,293	12,364	12,440	13,925	8.18	2.5
Lombok Tengah	14,926	15,865	16,125	16,258	16,746	-2.40	0.0
Lombok Barat	5,094	5,094	3,140	3,140	4,922	4.60	1.0
Lombok island	34,533	33,313	31,369	31,833	35,593	0.98	1.2
Total	45,395	45,638	41,338	40,106	44,651	0.20	0.0

Source: Dinas Peternakan NTB.

Animal barns, usually located next to the farmers house,are still very simple and have soil floors unlike Javanese wooden or bamboo barns. If the animals are kept inside day and night the floor can be very damp. Feeders are made of bamboo allowing only the animal's head to get through. Cleaning of the feeders is not done regularly.

Production and Reproductive Performance

The average body weight of FT in Lombok is 25.2±12.9 kg at 1-year old. There is a large variation in body weight caused by differences in sex and place of origin. Males are larger than females. Sheep from Lombok Timur (39.9±10.5 kg) are larger than from Lombok Barat (18.[illegible]±0.9 kg).

In a study in Kabupaten Lombok Barat, Hamidi (1989) observed that the average daily gain for 7-month old unshorn males was 16.6±6.6 gr. Since shorn animals had a lower weight gain (13.9±1.4 gr) than unshorn animals, shearing is practised by few farmers.

Survey results in Lombok suggest that FT ewes have their first lambs at the age of 1.5 years. Litter size varies between 1 and 4 lambs, but in general the range is 1-2, with a lambing interval of 7-8 months.

Disease

Information on specific diseases of FT sheep is not available. In general, there are 7 types of diseases for large and small animals in NTB: Anthrax, Surra, MCF, Scabies, Baliziekte and Strangles. The distribution and the characteristics are not the same (Table 6).

Table 6. Distribution and incidence of animal diseases in NTB (1988/1989)

Kecamatan	SE		Ant		Sur		MCF		SC		BZ		ST	
	Sp	En	Sp	En	Sp	En	Sp	En	Sp	En	Sp	En	Sp	En
Lombok Barat	-	-	-	-	-	-	2	3	1	2	1	-	-	1
Lombok Tengah	-	-	-	3	-	1	5	2	-	-	-	-	-	-
Lombok Timur	-	-	-	-	-	-	7	2	-	-	3	2	-	-
Sumbawa	8	4	1	4	5	4	1	1	-	1	-	5	1	1
Dompu	3	1	1	1	2	2	2	2	-	-	-	-	-	2
Bima	-	5	2	2	-	3	4	3	1	1	1	1	-	-

Source: Dinas Peternakan NTB.
SE = Septicaemia epizootica ; Ant = Anthrax
Sur = Surra ; MCF = Malignant catarrhal fever
SC = Scabies ; BZ = Baliziekte
ST = Strangles ; En = Enzootic
Sp = Sporadic

Lombok has been free from *Septicaemia enzootica* since 1985. Anthrax and Surra are relatively rare in Lombok when compared to Sumbawa.

NTB Government Policy

The NTB government through Dinas Peternakan has defined cattle production as the first priority for animal development. Many programs to increase cattle production (upgrading of Bali cattle, increasing meat production, and prevention and eradication of diseases) are underway. Upgrading of Bali cattle started in Sumbawa

island during Pelita I and the island is expected to produce high quality breeding stock of this breed. Efforts to increase meat production in Lombok included importing of European cattle such as Limousine, Simmental, Hereford and Brahman.

Although there is no written regulation against raising sheep in the neighbourhood of cattle, Dinas Peternakan always recommend raising sheep away from cattle as a means of preventing disease dissemination, particularly in regard to MCF. This has been translated into a net reduction in numbers of sheep and annual growth rate (Table 7).

Table 7. Animal population in NTB in 1988; annual increase and target

Species	Number	Annual Increase (%)	
		Actual	Target
Horse	79,535	3.71	1.5
Cattle	343,030	4.48	2.0
Buffalo	226,496	2.31	1.0
Goat	266,598	2.12	3.0
Sheep	44,651	0.20	0.0
Pig	20,101	6.36	10.0

Source: Dinas Peternakan NTB.

Slaughtering

In 1988 most of the sheep slaughtering in NTB occurred in Lombok island (93%). In Lombok, 75% of slaughtering was done in Kabupaten Lombok Barat, because of the population concentration and the proximity to the capital city. During Pelita IV the average increase of sheep slaughtered per year in Kabupaten Lombok Timur was 156%, in Kabupaten Sumbawa 79% and in Kabupaten Lombok Barat 61% (Table 8).

Of the animals slaughtered in NTB during Pelita IV sheep had the largest increase per year (53%) (Table 9). The increase in slaughtering rate of goats per year was also high (Table 9). These figures indicate that the demand for meat of small ruminants has increased.

Table 8. Slaughtering of sheep per kabupaten in NTB during Pelita IV

Kabupaten	1984	1985	1986	1987	1988	Average increase per year (%)
Lombok Barat	299	561	303	714	1,262	60.92
Lombok Tengah	54	0	14	81	105	23.61
Lombok Timur	0	0	50	78	211	156.63
Sumbawa	21	69	27	49	81	78.62
Dompu	2	0	0	0	0	0.00
Bima	61	46	42	14	30	3.59

Source: Dinas Peternakan NTB.

Table 9. Slaughtering of animals in NTB during Pelita IV

Species	1984	1985	1986	1987	1988	Average increase per year (%)
Cattle	15,791	16,341	17,020	17,565	19,777	5.89
Buffalo	6,383	9,383	5,459	5,585	6,199	0.28
Horse	1,139	1,910	1,506	1,456	1,649	14.13
Goat	4,991	5,699	6,136	7,130	7,594	10.49
Sheep	437	641	436	936	1,689	52.46
Pig	4,834	3,647	2,645	3,679	4,048	-0.73

Source: Dinas Peternakan NTB.

Economics

Marketing of sheep is limited to the province of NTB itself. In Lombok island sheep are sold on established market days. There are 13 animal markets in Kabupaten Lombok Barat and 5 each in Kabupaten Lombok Tengah and Lombok Timur. Animals are sold by their owners or middleman. Animal owners notify trusted middleman of the animals to be sold. Before the market day the middleman will collect the animals and bring them to the market if a price is agreed upon. The middleman usually pays half the price first, and the rest a week later (sold or unsold). Thus, a middleman usually has a large animal barn to keep animals until the sale is achieved.

The price of sheep fluctuates and reaches a maximum just before Idul Adha and the month of Maulud (Islamic ceremonies) because of high demand. Changes in price of sheep and their by- products in NTB, during Pelita IV, are presented in Table 10.

Table 10. The price of sheep and their by-products in NTB, during Pelita IV (in Rupiah)

Commodity	Unit	1984	1985	1986	1987	1988
Slaughtered animals	kg live weight	8,000	1,000	1,150	1,250	1,400
Breeding stock:						
- males	head	19,500	20,000	22,000	22,000	25,000
- females	head	17,000	18,500	19,500	20,000	21,000
Mutton	kg	2,500	2,750	3,500	4,000	4,500
Skin	kg	——not available——				

Source : Dinas Peternakan NTB.
1 US$ = Rp. 1,920.

Animal owners and middleman indicate that the price of FT is higher than that of thin-tailed sheep. In the Kabupaten Lombok Timur market, the average price (1990) for a breeding female is Rp. 32,500,-. A mature ewe can be worth up to Rp. 100,000,-. In Kabupaten Lombok Barat the price of FT sheep is also relatively high, Rp. 50,000 to Rp. 60,000 for a 1-2 year old male.

CONCLUSIONS

There is a potential for production of fat-tailed sheep in NTB . The average increase in population per year for fat-tailed and thin-tailed sheep in Kabupaten Lombok Timur was high (8.18%). An opposite trend however was characteristic of other regions because of the government program for expansion of Bali cattle. This suggests the need to regionalize production establishing defined areas to be devoted to sheep production.

Research should be directed toward finding a vaccine to prevent MCF in cattle. This can eventually guarantee the presence of a sheep population in the region with the potential to increase its meat

production capability. Production and reproductive performance of both fat-tailed and thin-tailed sheep should be studied to define the best type of animal for the region's conditions.

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RESEARCH ON JAVANESE FAT TAIL (JFT) SHEEP IN SUB-BALITNAK GRATI

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Sub Balai Penelitian Ternak Grati

INTRODUCTION

Since 1987/1988, the Sub-Balitnak Grati has had the mandate to conduct research on JFT sheep. Research at Sub-Balitnak Grati emphasized collection of basic data regarding the productivity of JFT sheep in traditional production systems at various villages of East Java, especially in those with high proportions of JFT. This report summarizes research results obtained in the Sub-Balitnak sheep research program.

RESEARCH RESULTS

Profiles of villages with a large population of JFT sheep relative to other livestock

In order to know the conditions regarding sheep production in villages with large populations of JFT, a study was conducted at Toyaning, Rejoso sub-district, Pasuruan district (Wahyono et al., 1989). The results suggested that in villages with a large population of JFT sheep (in relation to other livestock):

- Cattle or buffalo have no significant role for the tillage of rice fields or for transportation.
- Almost all farmers were smallholders with small yards averaging 30 m^2 per household.
- There was abundant supply of green forage on the roadsides and marginal land.
- All farmers thought that the market was auspicious for sheep production.

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Characterization of JFT sheep marketed in animal markets of East Java

To explore variation in body weight, age (estimated by numbers of incissors) and sex among JFT sheep sold at local markets, a survey was conducted by Ma'sum et al. (1988), in Probolinggo and Malang.

Weights and age of marketed animals had a large range of variation (Table 1 and 2). A considerable proportion of animals were sold at low age and weight. Furthermore, the ratio of females/males (1.6:1) indicated the marketing of many potential breeding females, a practice that may have population implications for this breed.

Table 1. Distribution of body weights among JFT sold in local animal markets

Body weight classes (kg)	%
8	3
9 - 20	39
21 - 32	39
33 - 44	15
44	4

Source: Ma'sum and Yusran (1988).

Table 2. Age distribution of JFT sheep marketed at local animal market

Pairs of incisors	%
0	63
1	13
2	12
3	5
4	7

Source: Ma'sum and Yusran (1988).

Body weights and tail measurements of JFT sheep in East Javanese villages

This study was conducted to determine some population characteristics of JFT sheep in upland and lowland villages during the dry and wet seasons (Yusran et al., 1988).

Ewes were classified into 4 age groups; 1, 2, 3, and 4 whether they had 1, 2, 3, and 4 pairs of incisors, respectively. No differences between altitudes and between seasons within all age groups were found for the analyzed traits (Table 3).

Table 3. Performance of JFT ewe at upland and low land villages during the dry and wet season in East Java

Pairs of incisors	Traits	Upland villages		Lowland villages	
		dry season	wet season	dry season	wet season
1	BW (kg)	27.0	26.5	26.1	24.3
	TL (cm)	19.8	19.8	22.3	21.2
	TW (cm)	6.6	8.0	8.0	6.5
2	BW (kg)	27.9	29.1	27.8	27.9
	TL (cm)	19.3	21.3	22.5	21.6
	TW (cm)	6.3	7.5	8.1	7.3
3	BW (kg)	31.3	29.9	26.7	28.5
	TL (cm)	18.5	22.2	22.2	21.4
	TW (cm)	6.4	7.6	7.3	7.4
4	BW (kg)	29.3	32.8	30.5	28.1
	TL (cm)	20.7	20.4	22.8	21.9
	TW (cm)	5.7	6.6	6.3	6.9

BW: body weight, TL: tail length, TW: tail width
Source: Yusran et al. (1988).

Economic value of raising rams in traditional sheep farms

In order to appraise the economic value of raising rams in traditional sheep farms, a survey was conducted (Wahyono and Wijono, 1989) in the villages of Banjarsari, Trewong Kidul and Muneng, Probolinggo, and in the village of Toyaning, Pasuruan.

Main results were:

- Males were kept primarily for capital accumulation and for marketing during strategic periods of the year when higher profits can be obtained from premium prices.
- In villages next to animal markets no problems due to lack of breeding rams were found. Farmers in these villages can utilize males that are on sale for breeding purposes.

Improvement the feed quality for JFT young rams

The response of JFT young rams to feeding with rice bran mixed with salt, minerals and gamal (*Gliricidia maculata*) leaves as supplement to a basal diet of king grass (*Pennisetum purpureuophoides*) was evaluated in terms of intake, average daily gain and libido activity (Musofie et al., 1990b).

The results suggested that supplementation of rice-bran mixed with salt-mineral (2% body weight basis) or gamal leaves (3% body weight basis) resulted in significant weight gains with no apparent effect on libido (Table 4).

Litter size of JFT ewes in traditional sheep production system

The variation in litter size and the effect of body weight and age (estimated from pairs of permanent incisors) in JFT ewes raised in traditional sheep production systems was investigated (Yusran et al., 1990).

No effects due to body weight and age of ewe on litter size were found. The estimated average litter size in this study was 1.7 lambs. The results also revealed that farmers flush their ewes prior to mating.

Improvement of feed quality for pregnant and lactating ewes

The response of pregnant and lactating JFT ewes to concentrate as supplement to a basal diet of elephant grass (*Pennisetum purpureum*) was evaluated in terms of intake, daily gain of ewes, birth weights and preweaning growth (Musofie et al., 1990a). Results of this study are shown in Table 5.

Table 4. Effect of supplementation with rice bran and gamal leaves on DM, CP, and NDF intake, daily gain and libido of JFT young rams

Traits	Treatments		
	King grass	King grass+ rice bran[1]	King grass+ gamal leaves[1]
Intake (g/W $^{0.75}$)			
- DM	62.98 [a]	88.41 [c]	72.03 [b]
- CP	4.55 [a]	9.41 [c]	7.21 [b]
- NDF	48.74 [c]	47.10 [b]	45.08 [a]
Daily gain (g/day)	3.84 [a]	22.88 [c]	14.15 [b]
Libido	- no significant differences -		

[1] Rice bran mixed with salt-mineral or gamal leaves were offered 2% and 3% of animal body weight gain, respectively.
[a,b,c] means within a row with different superscripts are significantly different ($P<0.05$)
Source: Musofie et al. (1990b).

These results suggested a potential for improving pre- weaning growth and weaning weight of JFT lambs by increasing DM intake of lactating JFT ewes, from 2% to 4% of body weight with more than 106 g/head/day of CP. On the other hand, no responses to increased DM and CP intake were observed among pregnant JFT ewes with regard to birth weight of their lambs. In this experiment, the weight of pregnant or lactating JFT ewes consuming only elephant grass was depressed as was the preweaning growth of their lambs.

Growth performance and heritability of JFT Dormas and Suffas crosses

Crossbreeding of JFT sheep with Dormas and Suffas sheep was expected to improve the productivity of local sheep. Body weight measurements of JFT sheep and crosses with Dormas and Suffas sheep during 1979-1985 at UPT Garahan were examined and used for estimating heritabilities for some traits (Wijono and Hardjosoebroto, 1989). The results are given in Tables 6 and 7.

Table 5. The effect of supplementation of pregnant and lactating JFT ewes fed with elephant grasses basal diet

Traits	Treatment	
	Elephant grass	Elephant grass + concentrate
Intake (g/day):		
Dry matter	825 [a]	1,262 [b]
Crude protein	66.64 [a]	128.25 [b]
Daily gain of ewe (g/day)	- 6.92 [a]	28.57 [b]
Birthweight of lamb (kg)	2.00 [a]	1.98 [b]
Daily gain of lamb on pre-weaning growth (g/day):		
Male	111.76 [a]	162.44 [b]
Female	91.15 [a]	145.34 [b]
All	101.45 [a]	153.89 [b]
Weaning weight of lamb (kg)	8.49 [a]	11.83 [b]

[a,b] Means within a row with different superscripts are significantly different ($P<0.05$) ; Source : Musofie et al. (1990a).

Table 6. Average weight of JFT, Dormas and Suffas Crosses at birth, weaning, 7- and 10-month age

Breed	Bodyweight (kg)			
	At birth	At weaning	7 months	10 months
JFT	2.40±0.88[a]	7.21±1.86[a]	9.65±1.74[a]	12.70±2.19[a]
Dormas crosses	2.88±0.22[b]	8.00±3.35[b]	11.73±2.75[b]	14.91±3.01[b]
Suffas crosses	2.79±0.22[b]	8.24±2.86[b]	12.66±2.69[c]	16.50±3.75[c]

[a,b,c] Means within a column with different superscripts are significantly different ($P<0.05$).
Source: Wijono and Hardjosoebroto (1989).

Table 7. Heritabilities of body weights at different ages in JFT, Dormas and Suffas crosses

Weight at	JFT	JFT x Dormas	JFT x Suffas
Birth	0.06	0.12	0.06
Weaning	0.26	0.27	0.23
7-month age	0.29	0.33	0.40
10-month age	0.48	0.38	0.59

Source: Wijono and Hardjosoebroto (1989).

Regressions that contributed to the variation of body weight at 7-18 months of age are shown in Table 8.

Table 8. Regression coefficients of live weight on body length and height

Breed	Regression (b)	Determination coefficient (R^2)
JFT	0.74 [1]	0.74
Dormas cross	1.20 [2]	0.84
Suffas cross	0.84 [1]	0.81

[1] Regression on height ; [2] regression on length
Source: Wijono (1988).

Although crossbred JFT x Dormas and JFT x Suffas sheep recorded higher body weights than JFT sheep, further analysis should evaluate changes in reproductive traits before crossbreeding is considered as a viable avenue of production improvement.

SUB -BALITNAK GRATI RESEARCH PROGRAM ON JAVANESE FAT TAIL SHEEP

Sub-Balitnak Grati intends to develop a research program to generate appropriate technologies to increase production of JFTsheep.

The objectives of the research programmes are:

- To evaluate the productive potential of JFT sheep for meat production under intensive management as well as village conditions.
- To improve productivity of JFT sheep through improved reproduction, nutrition and management within the framework of the local farming systems and environmental conditions.
- To improve the productive potential for JFT through selection (genetic improvement).
- To define socio-economic and biological constraints to sheep production in the region.

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PRODUCTION AND REPRODUCTIVE PERFORMANCE OF JAVANESE FAT TAIL SHEEP

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INTRODUCTION

Methods of sheep raising in Indonesia are still traditional and sheep rearing represents only a secondary farming activity. In java, most sheep are kept in pens, and some are allowed to graze for a few hours during the day, depending on the availability of pasture and labour for sheepherding. Therefore, productivity levels largely depend on the activities of individual farmers.

The Javanese Fat Tail (JFT) sheep is one of the indigenous breeds in these traditional farming systems, found mainly in dry regions such as East Java and the Island of Madura. JFT sheep are characterized by fat deposits in their tails, which serve as an energy source during feed shortage in a long dry season. While considerable information is documented for other equally important breed of Java (the Javanese Thin Tail), little is known on JFT sheep production performance. Most of the literature on JFT sheep highlights their prolificacy (Mason, 1988; Djuniarti and Winantea, 1982) and their reproductive non-seasonality (Djuniarti and Winantea, 1982). In this paper, research results on growth and reproduction of JFT obtained at the Research Institute for Animal Production (RIAP) in Bogor are reported.

PRODUCTION PERFORMANCE

Growth

Table 1 summarizes body measurements and traits obtained in an experimental flock kept at RIAP, Ciawi, Bogor. Average birth weights of male and female were 1.9 and 1.8 kg and preweaning daily weight gains 80.4 g and 67.8 g, respectively. Weaning weights of males were 9.1 kg and of females 7.9 kg. Birth and weaning weights were influenced by type of birth (e.g. single, twins, etc).

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Post weaning growth depends on the quantity and quality of feed available. Most flocks receive low quality feed (only grasses) resulting in slow growth (approximately 35 g/day), although the potential growth rate is higher (54-112 g/day) (Sutama, unpublished data). A slaughter weight of about 20 kg can be attained at an age of 7-8 months.

Table 1. Body weights and traits of JFT sheep (mean ± SE)

Trait	Males	Females
Body weight (kg) at:		
birth	1.9 ± 0.1	1.8 ± 0.1
weaning (3 months)	9.1 ± 0.5	7.9 ± 0.4
6 months	14.8 ± 0.7	13.6 ± 0.8
9 months	21.3 ± 0.8	18.9 ± 0.7
12 months	24.6 ± 1.6	20.1 ± 0.5
adult	30.6 ± 0.7	22.6 ± 0.3
Preweaning weight gain between birth and weaning (g/day)	80.4 ± 0.4	67.8 ± 0.3
Tail size (cm) :		
length	23.8 ± 1.2	25.7 ± 1.1
width	11.0 ± 0.3	10.2 ± 0.4
depth	5.1 ± 0.4	3.9 ± 0.3

Sexual Development

Unlike sheep from temperate regions, JFT animals are non seasonal breeders. The average age at puberty was 8.6 months in females and 6.4 months in males (Table 2).

The average age at first conception was 9.7 months with a body weight of 15.2 kg; therefore, first lambing occurs at an age of 14-15 months. Similar performance was observed in Javanese thin tail (JTT) sheep (Sutama et al., 1988a). Although mating ewe lambs early increases the ewes lifetime total production (Ponzoni et al., 1979), the long-term effect of early mating on JFT needs to be evaluated before adopting early matings. The pregnancy rate of ewes mated on the first oestrus was 48.2%. The low pregnancy rate was assumed to be attributed to lower ovulation rate during the first oestrus; a common trend among young ewes of both JTT sheep (Sutama et al., 1988a) and

sheep from temperate regions (Dyrmundsson, 1973; Edey et al., 1978).

Table 2. Reproductive traits of Javanese Fat Tail sheep (mean ± SE)

Traits	Age (days)	Body weight (kg)	Ovulation rate
Females:			
First oestrus (puberty)	258 ±3.9	14.8 ± 0.5	1.2 ± 0.2
First conception	290.8 ±4.8	15.2 ± 0.3	1.5 ± 0.2
First lambing	436.9±5.3	20.9 ± 0.4	-
Males:			
Puberty[1]	192.5±11.0	13.1 ± 0.7	

[1] Based on the development of penis (Dun, 1965)

Mating

As with other Indonesian sheep breeds, breeding activity of JFT ewes is not seasonal. This aseasonal pattern has the potential to support high lifetime total lamb production, provided that other production aspects such as nutritional, health and management are kept at a level to sustain basic animal requirements.

The average length of the oestrus cycle was 16.3 days with an oestrus duration of 25.2 ± 0.2 hours (Table 3). This was within the range (20-32 hours) observed in JTT sheep (Sutama et al., 1988b).

Table 3. Oestrus, ovulation, conception, and gestation of JFT sheep

Traits	Mean ± SE
Length of oestrus cycle (days)	16.3 ± 0.4
Duration of oestrus (hours)	25.2 ± 0.2
Ovulation rate	2.1 ± 0.2
Matings per conception	1.2 ±0.05
Gestation period (days)	147 ± 1.0

The effect of the ewe's fat tail on mating success has been the subject of some research. Obst et al. (1980) reported that the fertility of JFT ewes was lower (42%) than that of JTT sheep (98%). Furthermore, George (1982) reported that some males failed to mate because of impediment caused by the fat tails of the ewes. Sutama (1990) observed that JFT males have the same ability and efficiency when paired females with or without a fat tail (Table 4), but the tail size of the ewes in Sutama's experiment was smaller than those reported by George (1982).

Although docking of fat tails could overcome mating difficulties, this practice may not be acceptable by farmers for cultural and religious reasons. Moreover, in some regions a large sized tail is preferred and influences the price of an animal. Docking of breeding females could be considered in intensive farming enterprises. Mating through artificial insemination and hand mating are impractical methods to solve the physical impediment caused by fat tails.

Table 4. Mating performance of Javanese Fat Tail rams during 20 minutes test (mean ± SE)

Variables	Mating performance	
	undocked ewes	docked ewes
Total mountings	21.6 ± 4.8	14.4 ± 3.9
Interval between introduction and mating (min)	1.6 ±0.3	1.0 ± 0.2
Total mating	3.0 ± 0.5	3.8 ± 0.2
Mating interval (min)	5.8 ± 0.7	5.3 ± 0.5
Ratio mounting/mating	4.9 ± 1.0	3.8 ± 1.0

Source: Sutama (1990)

Gestation Period

The average gestation period was 147.0 ± 1.0 days, range 144-151 days. This value was similar to that of JTT sheep and sheep from the sub-tropics (Sutama et al., 1988a). Ewes with single lambs had a slightly longer gestation period (147.7 ± 0.5 days) than ewes with twins (145.9 ± 0.8 days). The gestation period for the first lambing (146 days) was shorter than that for the second (147.5 days) or the third (148.6 days).

Prolificacy and Other Reproduction Traits

Table 5 shows the lamb production and the reproductive performance for the first 3 parities of JFT ewes. In three breeding seasons, the fertility rate was 86-94%. These values were higher than that reported by Obst et al. (1980) (42%).

Table 5. Reproductive performance and lamb production of JFT in 3 parities

Traits	Parity		
	first	second	third
Number of ewes joined	85	84	82
Number of pregnant ewes	76	78	77
Fertility (ewes pregnant/ ewes joined)	0.89	0.93	0.94
Number of abortions	3	2	0
Ewe weight at lambing (kg)	20.9 ± 0.4	24.0±0.4	26.3±0.5
Ovulation rate	1.5 ± 0.2	1.8±0.2	2.1±0.2
Prolificacy (lambs born/ewe lambing)	1.38 (101/73)	1.59 (121/76)	1.75 (135/77)
Lamb survival (%)	82.2	80.9	63.7
Reproduction rate (weaned lambs/ewes joined)	0.98 (83/85)	1.17 (98/84)	1.05 (86/82)
Weaning weight/head (kg)	-	8.6 ± 0.3	8.3 ± 0.3
Total weaning weight/ewes joined (kg)	-	10.3 ± 0.4	10.2 ± 0.4

Ovulation rate (range 1.5-2.1) and other reproductive traits increased with age. According to Bradford et al. (1986) the high prolificacy in Javanese sheep is apparently controlled by a single dominant gene. The proportion of ewes with singles, twins, triples and with litter size 4 were 54, 36, 9 and 1%, respectively (Table 6). The overall sex ratio was 54:46 (males:females) (Table 7).

Post Lambing Reproduction

The interval between parturitions and the first post-partum oestrus is an important factor which affects the reproductive efficiency

Table 6. Distribution of litter size in JFT sheep

Parity	No. of litters	Litter size				Mean Litter size
		1	2	3	4	
1	73	65.8	30.0	4.1	-	1.38 ± 0.1
2	77	53.2	36.4	10.4	-	1.57 ± 0.1
3	77	44.1	40.3	11.7	3.9	1.75 ± 0.1
Mean		54.4	35.6	8.7	1.3	1.57 ± 0.1

Table 7. Distribution of sex of JFT lambs

Parity	No. of lambs	Males(%)	Females (%)
1	101	60.4	39.6
2	121	50.4	49.6
3	135	49.6	46.5
Mean		53.5	46.5

of sheep. Table 8 shows the reproductive performance of JFT mated at first, second and third oestrus after parturition. The first oestrus occured 14-65 days (average of 46 days) after parturition. Although all animals ovulated, the pregnancy rate for mating at first post-partum oestrus was only 43%. The pregnancy rates improved when matings occured at the second or the third oestrus 57% and 92%, respectively. As a consequence of this low pregnancy rates at first and second post partum oestrus, the reproductivity rates were also low (0.57 and 0.79, respectively).

In general, JFT ewes come into heat and conceive during lactation. Therefore, a lambing interval of 7-8 months or 3 lambings in 2 years is feasible.

Lamb Survival

Detailed information on embryo mortality in JFT sheep is not available. The ratio of ovulation rate to the litter size born suggests

Table 8. Reproductive performance of JFT sheep mated at first, second, and third post-partum oestrus (n=14)

Trait	Post-partum oestrus		
	first	second	third
Interval (days) :			
parturition-1st oestrus	44.5 ± 4.2	45.3 ± 3.0	47.2 ± 1.2
1st oestrus-2nd oestrus	-	16.3 ± 0.9	16.5 ± 0.2
2nd oestrus-3rd oestrus	-	-	16.2 ± 0.6
Ovulation rate (%)	1.1 ± 0.2	2.2 ± 0.3	2.7 ±0.3
Pregnancy rate (%)	42.8	57.1	92.3
Prolificacy			
(lambs born/ewes lambing)	1.33	2.50	1.83
Litter weight (kg)	3.0 ± 0.4	4.0 ± 0.4	3.4 ± 0.4
Reproductivity			
(lambs weaned/ewes joined)	0.57	0.79	1.28

that embryo mortality rate was 10-42% (Sutama, 1989; Sutama et al., 1989). Pre-weaning average mortality was 25% over all parities (Table 5), but this figure was not corrected for litter size. Most (65%) of the lambs died during the first 3 days after birth (Table 9). Low birth weights were associated with the inability of lambs to obtain milk during the first few days after birth. Extra care is needed if small lambs are to survive. A relatively low milk production (400-1200 g/day) (Sutama, unpublished data) contributed to high preweaning mortality rate and low weaning weight, particularly for twins. Providing additional milk to lambs with low body weight or to those that do not suckle is a consideration to reduce preweaning mortality rate.

Table 9. Lamb mortality in JFT sheep

Age (days)	Number of dead lambs, n (%)	Birth weight (kg)
0 - 3	59 (65)	1.1 ± 0.1
4 - 30	15 (1)	1.5 ± 0.1
31 - 60	8 (9)	1.9 ± 0.2
61 - 90	8 (9)	1.7 ± 0.2

In paranthesis percentage

CONCLUSIONS

From the reproductive point of view, JFT sheep has the potential for high productivity. Ewes are sexually mature at a relatively young age, can be bred year-round and with short post- partum oestrus they can produce at a rate of 3 lambings in two years. The rather high prolificacy of the animals can significantly increase total production of the ewes. However, embryo and preweaning mortality rates are also relatively high and affect weaning outputs. Therefore, inclusion of prolificacy as a productive trait should be considered along with special management for lambs after birth.

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TOWARDS THE CONSERVATION AND IMPROVEMENT OF THE JAVANESE FAT TAIL SHEEP

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INTRODUCTION

Javanese Fat Tail sheep (JFT) are mainly distributed in the Province of East Java with an estimated population of 0.93 million head, representing 17.3% of the country's sheep population (Iniguez and Gunawan, 1990). They are the largest sheep breed of Indonesia and, as the name indicates, possess a fat tail which contrasts with that of the thin-tailed breeds from Java and Sumatra. JFT sheep are mostly white with a significant proportion of individuals (approximately 15-20%) relatively free of wool and some totally free. Both sexes are polled.

There are no records documenting the origin of this breed. However, they were found in Java as earlier as the 16th Century, as it is documented by the relations of European travelers (Nieuhof, 1682; Raffles, 1817). Mason (1980) reasonably suggested that JFT are related to the sheep of the Cape (Africa). It is assumed that the original population consisted of mainly hair sheep or at least of a great proportion of hair sheep. Further introductions may have changed this condition resulting in animals with a great variation of coats. A higher proportion of hair animals observed in Sapudi and Lombok, where sheep presumably were less influenced by introductions and uncontrolled crossing, supports to some extent the previous assumption. Wool in those animals that are wooled is very coarse and it is not regularly shorn nor utilized. Based on experimental evidence it is expected that animals free of wool may perform better due to less heat stress.

Research developed at the Cicadas Sheep Research Station in West Java and information obtained directly from farmers suggests that a major gene for prolificacy is present in the JFT sheep population. For instance, farmers estimate an average litter size of 1.5 lambs with some ewes producing triplets and, exceptionally, litters > 3 (Gani, 1987).

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Other production aspects, in particular those concerning life-time production are not well documented because of limited and dispersed information. We hope that this meeting will fill partially the information gap and will stimulate further research and development for this important animal resource.

There are some interesting facts that deserve special attention and relate to the production potential of the JFT sheep:

a) increased interest in the exploitation of hair sheep in South East Asia, specially for production systems integrating tree cropping and sheep,

b) existence of an specialized market for fat tail sheep in the Middle East as well as a market window for exportation of mutton,

c) unquantified information indicates also that fat tails bring higher prices in the local markets.

At least points a) and b) have the potential to generate an immediate production increase of sheep in this region for which R&D agencies should be prepared. Such a shift may also condition negative consequences mainly dictated by uncontrolled rate of extraction and the potential introduction of unadapted exotic breeds in the attempt to "improve" the JFT population.

General observations of the variability present in the JFT populations and its long term adaptation to the tropical conditions of the region, clearly indicate that there is potential for genetic improvement which could be oriented to satisfy the various demands of the market. Investing in a relatively low cost selection program could in fact lead to the development of genetically superior sheep in the region in a short period of time.

General procedure

A simple selection procedure could be easily implemented by a combined effort between Dinas Peternakan, Sub Balitnak Grati, Universities, etc. The implementation of this procedure would not involve costly financial support since infrastructure and manpower are already available.

The most suitable program appears to be composed of a breeding nucleus of outstanding sheep in the region operating with a group of farmers organized by the Dinas Peternakan. The breeding nucleus would develop an intensive selection and recording program, and the

farmer group would distribute the selection products (rams) from the nucleus as well as conducting, although in a simplified way, selection and record monitoring.

1. *The nucleus*

Foundation females of the nucleus should be collected from around East Java, particularly the area of Situbondo (where animals with better conformation can presently be found). A natural candidate for the nucleus flock is the breeding center at Garahan (Jember) that could support up to 400 heads.

Outstanding sheep should be selected on the following basis:

- Absence of wool on females and particularly males.
- Good body conformation and absence of visible hereditary defects.
- Twining (ewes should have raised at least 5 lambs in 3 lambings in two years).
- Absence of coloured animals (although JFT sheep are typically white) and absence of horns.

Animals should be identified by tattooing or ear-tags. Recording should include:

<u>On the adult ewes</u>

- record of body weights at mating, lambing and weaning
- lambing dates
- litter size
- litter weaned
- Kg of lamb weaned
- wool score

<u>On lambs</u>

- birth and weaning weights (weaned at 90 days of age)
- weight at 6 months

- mortality (and age at death + cause)
- wool score at birth

Rams would be selected from ewes having low scores for (or free of) wool, producing twins, and the rams having themselves reached higher weaning and post weaning weights (at 3 and 6 months, respectively). Approximately the top 5% of rams produced each year should be kept for breeding, for no more than 2-3 years, in the nucleus. The rest of selected rams can be distributed to organized farmers (base). Eventually, outstanding ewes from the base could be introduced into the nucleus. This to reduce inbreeding and increase the frequency of desirable genes.

2. *The base*

Base farmers could comprise farmers organized in improvement areas that could be easily serviced by Dinas Peternakan staff and personnel from the Sub Balitnak Grati and other agencies. Selected rams from the nucleus should be placed in the farmers' flocks. Monitoring of basic aspects of production should be implemented, including:

- number of lambs born and weaned per ewe
- lambing date
- wool score

As previously mentioned, outstanding ewes among the base flocks could be introduced into the nucleus flock, based on a contractual arrangement among the nucleus and base farmers.

An important consideration is that the management in the nucleus flock should be as good or better than the average management of the base. Management should be based on a continuous exposure to ram or on a system allowing a rate of 3 lambings per ewe each two years.

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THE ECONOMIC IMPORTANCE OF THE JAVANESE FAT TAIL (JFT) SHEEP FOR JAVANESE SMALLHOLDERS

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INTRODUCTION

In spite of declining size of agricultural landholdings, small ruminants continue to be part of the production systems of smallholder farmers. In general, small ruminants are prolific, relatively easy to rise, have low initial costs, are able to utilize crop residues and marginal land, and are easily marketed year round. Farmers raise small ruminants as a secondary activity by using marginal land for grazing, family labor for daily maintenance, and non-marketable or waste agricultural products for feedstuffs. The benefits obtained from these animal species include: reduction of cropping risks, capital accumulation, draft power, manure for fertilizer, social status, source of protein and source of supplementary income.

Java, the most populated island in the country, with 80% of the total human population also has the highest number of small ruminants (6,003,875 goats and 4,547,440 sheep) corresponding to 59 and 87% of the total goat and total sheep population in Indonesia, respectively.

ECONOMIC ASPECTS REGARDING JFT SHEEP

JFT Potentials in East Java

East Java is well known as a province with the highest concentration of JFT sheep, a breed that is well adapted to dry conditions. It is interesting to note that East Java farmers with less land areas for both rice paddy and dry land cropping are able to generate a remarkable farm income (Table 1). Van den Hoek et al. (1987) has estimated the costs and benefits from sheep and goat schemes in East Java and found that during a five year period a farmer, with an initial stock of four ewes, could sell an average of twenty eight young animals with

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a total market value of Rp.200,000.00 (US$ 104.17, exchange rate 1US$= Rp. 1,920.00) including the value of manure produced. This production level can eventually be increased as shown by Soedjana et al. (1988), who for a set of different farms using improved technologies for sheep and goat raising in Indonesia, summarized the total farm revenue as well as gross margin per animal unit, per ewe, and per labor used (Table 4).

Table 1. Family and farm characteristics

Variables	West Java	Central Java	Yogya karta	East Java
Age of HH head (yr)	45	39	42	45
Education(yr)	5	6	9	5
Farmer's group (yr)	4	7	10	3
Family size (persons)	5	5	6	5
Labor force (MED)	2.8	2.7	3.4	2.6
Sheep/goats experience (yr)	17	20	26	9
Farm size				
dryland (m^2)	5,885	5,577	22,200	2,408
paddy field (m^2)	4,746	2,462	7,050	3,477
Farm income/yr (x Rp 1000)	837	1,293	2,980	1,523

Source: Soedjana (1989) HH: Household MED : Man Equivalent Day

Although the average of small ruminant flocks kept by smallholder farmers in Java is about 7.3 head consisting of 1 ram, 3.1 ewes, 0.6 young male, 1.1 young female, and 1.5 lambs; larger flock sizes (9.7 head) are kept by farmers in East Java (Table 2). Young females are bred at about 11 months of age. About 30% of the farmers use the same ram while the rest rotate to avoid inbreeding. Litter size is 1.8 per ewe per parturition and the young lambs are weaned at 3.3 months. Generally, the animals are kept confined in a barn with some level of grazing according to the season. Most farmers keep their animals confined during both the rainy season (80%) and the dry season (60%). Few farmers own a breeding ram; the majority rent them as required.

Most farmers raise small ruminants as a capital saving. Nevertheless, in some cases raising of males follows a marketing plan particularly to target sales during Islamic holidays, such as "Idul Adha", when the demand and prices are considerably higher.

The general marketing trend in 50% of the farmers is to sell whenever there is a demand for cash; hence the "market age" concept is not important. Farmers consider that prices paid for the sale of sheep are fair even though the prices are based only on estimated, not actual, liveweight.

Table 2. Average flock size in Java (head)

Class	West Java	Central Java	Yogya karta	East Java
Rams	1.3	0.7	0.5	1.4
Ewes	4.0	2.2	2.4	3.9
Young males	0.4	0.4	0.9	0.9
Young females	1.1	1.0	0.9	1.5
Lambs	1.7	1.9	0.2	2.0
Total	8.5	6.2	4.9	9.7

Production Characteristics

Economics of sheep production mainly depends upon performance of the animals kept in the flock, the age at which the animals are marketed and the price received per unit, i.e. price paid per kilogram liveweight, plus the value of skin and manure. By incorporating the values of mature animals and by knowing the flock composition, income derived from the flock can be estimated.

In a production process there is a relationship between the level of inputs used and output produced. Generally, given a level of fixed resources, higher levels of output can only be obtained by adding more variable resources. Therefore, it is important for the farmer to identify the more profitable levels of inputs combined with a given level of fixed resources. The farmer should select the level of each input, such as grass, concentrate, labour and others that will increase the output to maximize profit. This relationship can be expressed as: Y=f(feeds, labour, other inputs), where Y is the quantity of output

such as kg liveweight obtained as a result of using feed and labour and other inputs. The following table presents some preliminary information on the JFT production traits.

Sabrani et al. (1982) presented a production relationship for small ruminant production in small farms of West Java. The relationship is expressed in kg of livewight achieved by sheep and goats (Y) as a function of time or age of the animals (X).

Table 3. Production performance of JFT sheep in an experimental station environment

	Males	Females
Weight (kg) :		
At birth	2.4	1.7
Three months	10.9	7.8
Six months	16.0	13.6
Nine months	21.9	18.9
Mature	30.6	22.6
Average daily gain (gr) (3 to 9 months)	78.8	59.0

This is very useful, particularly for estimating the production function of traditional small ruminants since it is very difficult to record the actual amount of inputs used at the smallholder farm level. The estimates suggest that in lowland areas, sheep reach a maximum liveweight of 17 kg at 16 months of age, while goats reach higher liveweights (about 21 kg) at the age of 22 months. In the upland area, sheep show better liveweight performance (about 26 kg) at the age of 19 months. However, maximum achievable liveweight in this analysis does not necessarily mean maximum profit for the farmer because the value of input used (costs) and the value of output produced (price) are not incorporated into the analysis.

According to Table 3, 24-month JFT males and females weigh 30.6 and 22.6 kg, respectively; these are greater weights than those achieved by the upland sheep in West Java. However, the marginal benefit of keeping the animals for some additional time in order to reach a specific weight has to be taken into consideration as additional costs are also to be incurred during that period. For example, Soedjana et al. (1990) presented the results including this consideration

using information provided by the SR-CRSP/Balitnak breeding project. The data to estimate the production function, $q_0 = f(q_4, T_1, T_2)$, were obtained from observations on weaning weights, average daily gains, feed consumption and feed efficiency, days on feed, and weights at the end of the feeding period.

A similar approach can be used for the JFT sheep as more data on production performance become available in the future.

Economic Importance of the JFT

Nearly ninety-nine percent of small ruminants in Indonesia are in the hands of smallholders and less than one percent are raised under fully commercial operations (Agency of National Export Development, 1988). This fact highlights the important role of smallholders, the backbone of the national small ruminant production. Prospects for exporting small ruminants and their products particularly to Middle Eastern countries has further enhanced the posibilities for these animals to become an important export commodity. For instance, the Agency for National Export Development, Ministry of Trade (1988) estimated that Saudi Arabia has an annual demand of 500,000 heads of small ruminants to be sacrificed during the period of Idul Adha.

Study on productivity of small ruminants in Java shows that there is place for improvement and opportunities for small ruminant farmers to increase their production efficiency beyond the levels currently achieved as opposed to the traditional production system which is only aimed at accumulating capital or as a saving purposes. In these local and international marketing scenarios the JFT sheep has indeed promising prospects, particularly because of their size and fat tails; traits that are highly demanded by the consumers. In fact, in the Middle East markets fat-tailed Nadji and Awassi sheep can be sold for more than US$ 250/head; five times more than imported Australian sheep.

An example of the economic profitability of a small ruminant enterprise is illustrated in Table 4, which shows gross margins derived from different flock sizes. From Table 4 it is clear that the gross margin (GM) and GM/MED of labour increase as the number of animals increase, but this is not true on a per animal unit basis (GM/AU) as well as per ewe basis (GM/ewe). This implies that the economic productivity of the animals are different. For example, the highest GM/AU (Rp. 784,800) and GM/ewe (Rp. 50,700) were

obtained by farm V, not farm VI which shows the highest total GM (Rp.16,521,500) and GM/MED (Rp.1,835,700).

Table 4. Gross-margin analysis for six specialized small ruminant farms in West Java

Description	Farm					
	I	II	III	IV	V	VI
No. of animals (AU)	1.05	1.33	1.48	3.24	5.17	24.00
No. ewes (hd)	11	16	15	24	35	200
Farm labour (MED)	3	1	4	5	14	9
Production rate (%)	173	213	153	205	238	300
Total costs (Rp.000)	802.9	192.4	3557.5	2413.2	4005.1	13738.5
MED/AU	2.86	0.75	2.70	1.54	2.70	0.38
Gross revenue(Rp.000)	539.8	499.0	4028.8	4121.0	8062.3	30260.0
Gross margin (Rp.000)	-263.0	306.7	471.3	1707.8	4057.2	16521.5
GM/AU (Rp.000)	-250.5	230.6	318.4	527.1	784.8	688.4
GM/ewe (Rp.000)	-23.9	20.4	33.5	40.7	50.7	41.3
GM/MED (Rp.000)	-87.7	306.7	117.8	341.6	289.8	1835.7

Source: Soedjana et al. (1988).
GM : Gross Margins ; MED : Man Equivalent Day ; AU : Animal Unit

Based on the estimated conversion rate on sheep body components multiplied by sale price, the value of the animal for the butcher can be estimated and compared with that when the farmer sells the animal on the basis of liveweight (Table 5). Using selling prices at farm level of Rp. 1,000 per kg liveweight, the value at the farm gate is Rp. 18,000. When the animal is slaughtered and each component is multiplied by its price then the total revenue from selling all components is Rp.27,800. Therefore, there is a difference in the value of the animal at the farm gate and at retail basis of about Rp.9,800 (54%). The difference has to cover all marketing costs and fees involved in transferring the animal from the farm to the retail level.

CONCLUSIONS

Small ruminants in many farming operations in Java, where human population density is high and the availability of land for agriculture

is decreasing, continue to be very important in improving farmers income. Increased demand for export could stimulate small ruminant farming to produce more efficiently as prices go up. Special attention should be given to research on JFT sheep and to explore potential of marketing JFT in the Middle East, since fat-tailed sheep have special prices in these specialized markets. The research should be directed toward technical feasibility (breeding, feeding, health control and management), economic profitability (in terms of increasing production efficiency and capturing potential international demand) and social acceptability.

East Java with the highest concentration of JFT sheep in Indonesia could profit from the development of JFT sheep either at the village level or through a nucleus-plasma type of project.

Table 5. Estimated revenue components of an 18 kg liveweight goat/sheep (1982)

Component	Weight (kg)	Retail price (Rp/kg)	Total revenue (Rp)
Carcass	9.0	2,200	19,800
Hides/skins	2.0	-	2,000
Inner organs	1.5	2,000	3,000
Head	1.5	1,000	1,500
Lower legs	1.0	1,500	1,500
Waste	3.0	0	0
Total	18.0		27,800

Source: Sabrani et al. (1982)

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CONCLUSIONS AND RECOMMENDATIONS

The workshop presentations were followed by a general discussion that led to the following conclusions and recommendations:

Production aspects

- Production performance and the real potential of Javanese fat tail (JFT) sheep for the local environment and production system have not been fully assessed. Therefore, breed evaluation and characterization should be conducted in on-station and on-farm evaluation programmes.
- This evaluation should be based on a life-time performance of ewes or at least three lambings per ewe.

Health

- Gastro-intestinal parasites are reported to be a common problem in the region. Bloat, diarrhoea and pink eye are also found in JFT sheep. The incidence and variations of these diseases during the year should be assessed on a more detailed basis. It is also important to assess the magnitude of economic losses due to health problems.
- Sheep are carriers of malignant catarrhal fever (MCF) and thus excluded from areas where cattle are being raised. More research on the epidemiology of MCF is needed, including development of a vaccine to prevent MCF.

Breeding aspects

- Uncontrolled crossbreeding programmes may lead to genetic erosion and may jeopardize the adaptability of JFT sheep. In fact, crossbreeding with exotic temperate breeds has produced populations with low fertility rates. Crossbreeding programmes should be evaluated carefully on the basis of contemporary comparisons, taking into account life-time reproduction performance of ewes, rather than growth evaluations only.
- Since JFT and Javanese thin tail (JTT) sheep coexist in some areas, JFT x JTT crossbreds and the parental populations should

be compared to assess the value of JFT in crossbreeding programmes in Indonesia.

- To protect JFT sheep as a genetic stock, efforts should be made to develop a nucleus of selected JFT sheep under government and research supervision.
- The potential of JFT sheep to produce hair sheep should be defined, since JFT sheep are considered to be the only South East Asian population with this capability.

Marketing

- Market information is not always available for farmers. In addition, farmers usually market their animals through a middleman who retains much of the profit. For the farmer to obtain a maximum benefit, it is recommended:

  * Improve the information system on marketing.

  * Study the role of the middleman in the marketing of small ruminants and alternative marketing systems.

- Although internal demand is still unsatisfied, foreign marketing presents an open alternative, particularly in the Middle East where premium prices are paid for fat-tailed animals. In this regard export-oriented production should be aggresively explored.

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