RABBIT PRODUCTION AND RESEARCH IN INDONESIA

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Abstract - In the early 80s, enthusiasm on rabbit raising was risen in Indonesia. The goal was aimed at improving the nutritional status of the low income rural dwellers. Active promotion was carried out by government institutes as well as by several non-government organizations. Various meat type breeds such as FG, NZW, Californian, as well as local breed were used. Raising management and feeds and feeding strategy were simple. A concept of 'mini meat factory' or 'biological refrigerator', in which through a set of breeding program applying 3 does and one buck to provides weekly meat consumption all year round was introduced. Substantial numbers of researches were conducted to boost the production. Most research topics dealt with the reproductive improvement and the nutritive value and utilization of the forages and by-product feeds. Survey results conducted in 1982 and 1988 indicated that rabbit raising was more income oriented, instead of for meat consumption. However, socio-cultural and technical and most of all marketing problems declined the interest of rabbit raising drastically. Moreover, lack of cooperation ability among farmers caused the situation worse. In response to the nation needs, in which agribusiness and export commodity are prioritized, at the late 80s, a new breed of rabbit, the Rex, was introduced. The objective was to produce materials for the export-oriented industry, yet still maintaining meat production. Researches were consequently reoriented to produce prime fur including the handling and tanning technology. This paper discusses the situation of rabbit production, researches as well as its potential, prospects and problems in Indonesia. The concept and program for livestock production, including the partnership system in farming, is highlighted.

INTRODUCTION

Food availability and its quality has become a great concern of the world especially in most developing countries, where substantial increase of human population occur but supply of food are short. Even worse, that food supplying farms, which usually are small in size will eventually get smaller as the consequence of human population pressure, yet have to serve as the primary source of food (CHEEKE, 1986). Furthermore, these farms have to be able to use inexpensive and readily available resources, such as by-product feeds and forages.

For Indonesia herself, with a 70 million additional people in the year 2000 (TEMPO, 1992), summing up to a 250 million people in the country, requires a careful planning and development for food production and its supporting researches in order to meet such substantial food needs. It is the unique situation of Indonesia, where there is pressure for meat consumption, increasing population density, small land ownership and abundant availability of forages or agriculture by products that creates a promising situation for rabbit production in Indonesia (CHEEKE, 1983).

Although it had been practised for quite sometime, raising of rabbit in Indonesia just started to have a significant attention in the early 80s. Prior to such time rabbit raising is only for a hobby and, to a less degree, for meat consumption (SARWONO, 1983). In the early 80s, rabbit raising was promoted to improve the nutritional status of the low income rural dwellers (SITORUS *et al.*, 1982). Rabbits were raised in various Breeding Centres and distributed to various areas extensively under the management of the Directorate General for Livestock Services and its regional Services [DGLS., 1981]. However, lack of knowledge to raise rabbits efficiently and inability to market the meat were major constraints that hindered the development of rabbit production in Indonesia. Consequently, compared with other livestock species, the contribution of meat from rabbits was very small or insignificant.

High value added and export oriented commodities are highly encouraged in Indonesia, and it has been recognized that leather products and garment industry are the leading export commodities. Besides, various Indonesian processed meat products such as jerky and dried shredded meat (*'abon'*) have been exported to many European countries particularly to the Netherlands. Looking at such opportunity, rabbit raising are then addressed to produce skin and/or fur, beside the meat. Rex rabbit was then selected to meet the purpose. Research and corresponding activities were then reoriented to serve fur rabbit production.

LIVESTOCK PRODUCTION AND DEVELOPMENT

As might have also occurred in other countries, meat production and livestock population in Indonesia were dominated by meat from broiler chickens and beef cattle (Table 1). Trend for meat production was dominated by

Table 1 : Meat production and import from 1989 - 1993 [000 ton]

Species	1989	1990	1991	1992	1993	Trend, %
Production :						
Large ruminant	295.9	303.5	309.7	342.0	359.0	5.0
Small ruminant	95.1	90.0	94.4	99.0	118.4	6.0
Pig	136.3	123.8	110.0	149.9	152.0	4.3
Chickens	432.4	498.2	5772.9	635.3	729.9	14.0
Ducks	10.0	10.5	10.5	11.3	VMU 11.4	3.36
Total meat	971.1	1027.7	1099.2	1239.2	1372.5	9.07
Import :						
Meat, ton	1910,3	834,4	5968,9	12002,0	10079,6	60,4
- beef	951,8	1422,4	1866,8	3148,9	3050,5	36,6
- small ruminants	167,8	266,5	334,7	680,2	519,0	104,3
- pig	13,4	16,7	6,0	11,7	44,7	84,4
- poultry	42,8	135,8	96,4	980,4	618,5	267,1
- beef liver	734,5	1993,0	3665,0	7180,8	5846,9	83,1
Leather, 000pcs	1735,5	2051,9	10186,7	59967,5	90132,4	238,

Source : DGLS, 1994

chickens, a highly reproductive and fast growing and animal. This situation, together from the import data resented in Table 2, to some extent indicated that the steadily increasing requirement of meat for Indonesian people could not be met by meat production from the local ruminants.

Deficit of meat, particularly for beef in 1995 was 90,000 ton and is estimated to increase to 99,000 ton in 1996. This amount is planned to be filled by intensifying production from small farmers (77 %), feedlot fattening (import of live cattle - 17 %) and from import of frozen meat (5 %). Exploitation of rabbits, with its high reproductive and fast growing potential could have contributed a substantial amount of meat for national needs. Nonetheless, in the last five years, contribution of meat from the rabbit were very small and was not accounted for national meat production.

Beside deficit in meat production, Table 1 also shows a substantial increasing import of skins. Rabbit skins, may to some extent substitute that imported skins, particularly for manufactured products that do not require high tensile strength.

RABBIT RAISING AND PRODUCTION

As indicated earlier, rabbit raising in Indonesia started to have a significant attention in the early 80s. The government and some NGOs, particularly those who work in the social welfare areas, put a priority program to improve nutritional status of rural dwellers through rabbit raising. Rabbit Village Breeding and Multiplication Centres (VBC and VMC) were built in various areas. From the VMC rabbit were distributed to farmers through Village Multiplication Unit (VMU) as illustrated in Figure 1-A. The VMU were managed by representative of farmers group.

Figure 1 : Schematic diagram of rabbit distribution plan. (Source : DGLS, 1983)

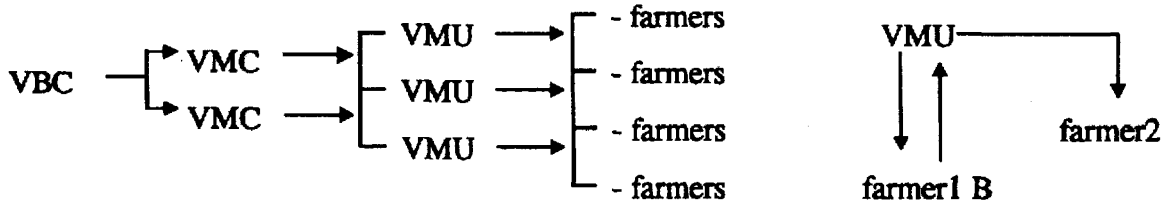

Diagram 1-B illustrates the distribution and redistribution of rabbit from VMU to farmer 1, who after one year period has to return twice as much to VMU, and the later will redistribute the rabbits to farmer 2, farmer 3 and so on. A package of rabbit from VMU consisted of one buck and three does. Table 2 showed 10 among 27 provinces

of Indonesia that were planned to receive rabbit package from the Government within 6 years period, starting in 1982. Provinces in Java (West, East, Central and DI Yogyakarta) are the most populated areas and are considered as 'the most experience' in raising rabbits, hence received the first package for development for other provinces.
In spite of the Government program, some social organizations also involved in the activity. One of them introduced a 'mini meat factory' concept. This concept applies 1 buck and three does and relying on the prolific reproductive ability of rabbit and through a set of breeding program (2 month mating interval], the rabbits can provide meat sufficient for weekly consumption for a family consisting of 5 person). Rabbit was once also popular as 'biological refrigerator'. This relates to a small size of rabbit that can be consumed at a time, hence the farmer does not need to store the meat in the refrigerator/freezer, a type of appliance that farmers and rural dwellers very difficult to have.

Table 2. Plan of rabbit distribution [000 head] in the six year program.

Province	Year						
	I	II	III	IV	V	VI	Total
North Sumatra	---	2.90	6.38	14.50	30.74	61.48	116.0
South Sumatra	---	1.75	3.85	8.75	18.55	37.1	70.0
Lampung	2.75	5.34	14.69	33.37	69.34	141.51	267.0
West Java	6.75	24.59	74.25	168.75	360.17	715.50	1350.0
Central Java	6.00	24.00	66.00	150.00	318.00	636.00	1200.0
DI Yogyakarta	2.00	4.00	11.00	25.00	52.00	106.00	200.0
East Java	7.50	30.00	82.50	187.50	397.50	795.00	1500.0
South Sulawesi	---	3.25	7.15	16.25	34.45	68.90	130.0
West Nusa Tenggara	2.25	4.95	11.25	23.85	47.70	90.0	
East Nusa Tenggara	---	1.93	4.23	9.63	20.40	40.81	77.0
Indonesia	25.00	100.00	275.00	625.00	1325.00	2650.00	5000.0

Sources : DGLS (1981)

Such promising program was unfortunately unfortunate. First constraint was inavailibily of continuous supporting fund, hence the program could not be continue, although the interest was high among farmers. SITORUS *et al* (1982) and SASTRODIHARDJO *et al* (1988) reported that the main interest of rabbit raising by farmers was to have cash income, followed by family meat consumption and manure production, especially in the vegetables-grown areas. Further data showed that second and third hindering factors were lack of knowledge for efficient rabbit raising and inability to market the meat were the main reasons for the decline of farmers' interest to raise rabbits. It was also noted that since most rabbit farmers are small in scale size, they had no bargaining power. It is therefore important to group them in a cooperative system.
Change of Government objective to boost export from the non-oil commodities, to encourage agribusiness through industry in the 90s caused a reorientation of livestock production system, from a traditional to a modern system, from a subsistent pattern of raising to industrial type of farming. Role of private sector/ industry are encouraged and expanded, while Government roles as regulator, facilitator and as dynamist/ motivator (SUHADJI, 1995). Following such policy, the Rex rabbit was introduced since 1988.
Rex was chosen for two reasons, i.e. to produce prime pelt for fur/leather industry and [ii] to maintain meat production, hence farmers could get cash income yet still having meat for their nutrition. Production and research activities were therefore readdressed to prime fur production as well as to meat production.

RABBIT RESEARCH

Prior to the introduction of Rex, most of rabbit researches were directed to exploit high reproducibility potential of rabbit and evaluation of locally available feeds for rabbits. Similar approach was followed with the case of Rex, especially when realized that Rex did not reproduce and grow as fast as the NZW rabbit, except that there were more attention paid to the prime fur production. Reproductive ability of some breeds of rabbits and some strains of Rex at various conditions are presented in Table 3.
There were reproductive differences among strains of Rex (Table 3). Black Rex was the most prolific, while Chinchilla was the least. Black Rex however produced smallest pelts, while Chinchilla and Blue Rex were widest (RAHARJO and TANGENDJAJA, 1988).
Similar to other rabbits, Rex are also able to reproduce within 40 days interval (at 7 day post partum rebreeding program) except that Rex litter size was lower. Other reports indicated, mortality was high (43 %), especially those raised at village system (SASTRODIHARDJO *et al.*, 1992). Enteritis was the major problem encountered. Interesting to note that does fed with forages supplemented with limited premixed diet (appr. 50 g/rabbit/d) produced more kits at weaning (5.6 vs 3.9), hence less mortality during lactation period. This evidence was

confirmed by RAHARJO *et al.* (1996) in an integrated vegetable-Rex farming system, hence showing the importance and potential of forages for rabbit feeding.

Table 3. Reproductive performance of six strains of Rex rabbit raised at 18 - 22 °C at Ciawi, Bogor, Indonesia.

Parameters	Black	Chinch	Choco	Blue	White	Red	Means
Lit. interval, d	36.6	39.0	38.4	43.6	43.9	35.7	40.1
Doe weight at kindling, kg	3.1	3.6	2.9	3.1	3.2	3.2	3.1
LS at birth,	8.2	4.7	6.3	6.1	6.4	7.6	7.1
alive	7.7	4.7	6.3	6.0	6.4	7.1	6.8
at weaning	6.2	3.3	4.4	4.8	5.5	4.3	5.3
Kit weight at weaning, g	460	560	390	550	510	540	480
Mortality, %	18.8	28.6	30.9	20.4	13.9	39.3	22.7
Ratio female/male	1.05	1.50	1.00	1.26	1.29	0.59	1.04

Source ; RAHARJO and TANGENDJAJA (1988)

Nutrition studies were mostly directed toward evaluation of the nutritive value of forages and by-product feeds. These types of study are particularly importance for small scale raising in the rural areas, where forages, vegetable wastes and by-product feeds are usually abundantly available. Many of the results have been published in the Journal of Applied Rabbit Research. Interesting to note that inclusion of 30 % peanut meal (RAHARJO *et al.*, 1992) or 40 % coconut meal [RAHARJO *et al.*, 1994] produced good growth and better efficiency than those of control diet. Coconut meal, in particular, is worth noting as it has very high digestibility values even for its ADF fraction regardless of age and breed [RAHARJO *et al.*, 1994]. Similar results were reported by GULTOM *et al.* (1990) when 60 % coconut meal was used in the diet. High content of galactomannans accounted in the fibre fraction (TAKAHASHI *et al.*, 1984), could posssibly be utilized by cecal microbes. Potential of rabbits in utilizing by-product feed, expressed as digestibility values, is presented in Table 4.

Table 4. Nutritive value of some feed ingredients in rabbits

Ingredient	Metab.	Digestibility			
	N	N	DM	Energy	ADF
Soybean meal	89.0	90.5	84.5	86.9	54.8
Peanut meal	84.6	87.8	76.5	79.4	41.4
Coconut meal	85.8	87.6	88.4	89.4	81.8
Pigeon pea	74.4	71.8	78.0	73.8	56.0
Candlenut meat	-44.4	67.2	57.0	58.7	25.9
Corn	88.1	75.5	87.5	87.1	48.3
Rice bran	–	62.6	69.5	71.6	26.9

Sources : RAHARJO et al. *[1988, 1992].*

Further study in nutrition involves the evaluation of solid state fermentation of high starch high fiber low protein by- or waste products, the use of feed additives such as Allyzime, Lacto Sacc, Acid Pak, essential fatty acids, etc. to improve not only the productivity, but also to produce better quality fur.

Other researches dealt with nutrient requirement, effect of types or level of fibers, effect of environments, roles of Mg in alleviating heat/cold stress, cage density etc. were reported. Intensive researches on semen evaluation were also carried out. Analyses on the physical quality of rabbit leather is shown in Table 5. Data showed that Rex skin is better, except the area, than that of Californian and NZW. This is understandable, since Californian and NZW were slaughtered at 2.5 - 4 month old, while Rex was slaughtered at 6 month old or more.

Table 5. Physical quality of tanned skinned from various breed of rabbits

Measurements	Californian	NZW	Rex	SNI
Weight of raw pelt, g	–	–	160 - 307	–
Weight of skin, g	185 - 218	218 - 257	98 - 117	–
Area of skin, cm^2	1263 - 1404	1444 - 1749	732 - 1174	–
Thickness, mm	0.63 - 0.66	0.66 - 0.70	0.60 - 0.70	0.70
Breaking length, %	51.3 - 52.3	57.5 - 61.3	65.0 - 79.0	> 50
Piercing elasticity, kg/cm	48.4 - 49.4	47.2 - 48.9	57.8 - 80.6	–
Tensile strength, kg/cm	108 - 115	112 - 114	150 - 240	>200
Stretching	43.9 - 44.7	43.7 - 46.3	18.8 - 26.3	17.5
Sewing strength, kg/cm	–	–	82 - 143	20

Sources : RAHARJO et al. *[1990, 1993], Indust.Nat.Std. [Dept.Industry, 1994]*

Economic analyses of rabbit raising in 3 different locations at various scales of raising indicated that raising Rex rabbits contributes significant cash income to the farmers eventhough the price of pelt and carcass was only about USD 2.50/pelt and 1.50/ kg respectively. Income earned was depended on the number of animals being raised. As much as USD 3.00/ animal could be earned by farmers for each period of raising (MURTISARI *et al.*, 1995; SUMANTO *et al.*, 1995). A significant cash contribution from rabbits fed forages was also noted (RAHARJO *et al.*, 1996).

INTEGRATED REX RABBIT FARMING

Concept of integrated Rex rabbit farming with a partnership approach will be discussed in more detail in the other paper of this Congress. Basically, the concept is aimed at strengthening the small scale farmers' position through a cooperative. This cooperative is shared by farmers and involves in the management, distribution, processing and marketing activities. Cooperative should seek a partner, which could be a private sector, industry, Government-owned enterprise or other cooperative. Cooperative provides necessary needs, facilities, consultation etc. for its members. In returns, Cooperative receives service charge, which is taken at the time his member sell the product. Cooperative may open some divisions, which activities are related to the main farming. In this case, horticulture division, tanning division as well as fur and leather manufacturing division.

Fur processing and manufacturing goods from fur or materials of its kind (stuffed toys, scarves, souvenirs, hand bags, small accessories, hats, etc.) could be carried out manually (not machinal), hence increase job opportunity. This type of work can be done by almost anybody with simple training which includes rural farmers and their family, in their spare time, for their additional income, hence creating more home industries. Quality of products including their uniformity, however, may vary among handicrafters and this can jeopardize the image of this good quality skins, hence reduce its potential price.

CONSTRAINTS

Characteristics of rabbit raising in Indonesia are small in scale, simple in management and are using available supplies. If the raising system is changed into commercial farming, the first problem faced is lack of managerial skill. High mortality rate, poor nutrition and poor management in addition, are very common cases. These potentially cause inefficiency and high production cost. For the Rex, the slaughter age is 6 month, hence there is more risk to loose the animals. Care, and attention should be paid for fur, or the product is of low quality. The later needs special skill.

CONCLUSIONS

Rabbit production in Indonesia is not considered to have significant contribution to the farmers as well as to the Government. It does not progress as its potential should be. However, farming Rex rabbit seems to be promising provided the management is well controlled in an integrated farming system with agribusiness approach. Research results indicated many of the results are applicable for Rex rabbit farming. Production technology, through research, however needs to be improved, to maximise productivity and fur quality as well as to increase profit for farmers. Research activities are directed towards fur production, including exploring the possibility of cross breeding with other potential prime fur producing rabbits.

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