Bulletin of Animal Science, Special Edition, 1995 *ISSN 01260 - 4400*

Transmigration Program With Animal Husbandry Model in Indonesia

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ABSTRACT: Transmigration program with animal husbandry model is aimed to ensure efficiency of the land potential and natural food in order to raise animal production, truogh the companys or private investment and is directed to meet the requirements of national animal protein and to boost the non-oil export. It is planned that the transmigrants should become self-supporting animal producers who possess privately owned lands, house, land for food-stuff and for animal food. Each transmigrant family is given 2 Ha of land, consisting of 0.5 Ha of houselot, 0.5Ha of arable land and 1 Ha of animal feeding land. The transmigration sites with animal husbandry model will be developed trough the cooperation of Public Undertaking (BUMN) or trough private entrepreneurs on a pattern of plasma-nucleus partnership. The role of the nuckeus enterprise in this case is to grand credit for animal feeding input besides technical establishment and marketing. Up to the present, animal component in the transmigrant farming system is only considered as asupporting activity to the mind activities in the existing developed models. Experiences in executing transmigration program show that animal component of the farming system can significantly increase the transmigrant's income. In Sosa II transmigration site, North Sumatra, for example, transmigrant's income during the third year of settlement from animal component of the farming system reached more than one million rupiah per year.

Key Word: Transmigration Program, Animal Husbandry Model.

Introduction

In the Fifth Five Year Development Programs (PELITA V), transmigration programs had developed very fast, not only through food crops models, but also through the development of other models such as Estate Crops, Forestry Industries, Fisheries and Services & Industries. For the PELITA VI programs, diversified programs will have to be executed.

Such development and diversification of the programs are in line with the direction of the Main Courses of the state direction (GBHN), 1993, which stated that the present transmigration models should be further developed and diversified based on the potential and comparative advantages of each region, but should be backed up with the fair supply of production inputs and facilities, investment and technologies which can give choice to the models which will give better income. One of the models which has good prospect to be developed is animal husbandry model. Up to now, the development of animal husbandry in the transmigration models which are being developed is only as a supporting activity to the main model which is being developed. Animals can produce manure, sources of power (draught animal: cattle and water buffalo), and as a liquid asset.

The development of the animal husbandry transmigration model is based on the following reasons :

1) Animal husbandry has been part of some of the transmigrants' daily activities before they joined the program.
2) Animals can be easily converted in cash or becoming capital which may be developed from the offsprings meat, milk and eggs.
3) Suitable lands are available.
4) Drought animals may increase the ability of the transmigrants in cultivating their lands. Without drought animals they can only cultivate less than 1,0 Ha (±0,95 Ha) of the 2.0 Ha they had received, while with the help of a pair of draught animals, they are able to cultivate ±2,26

Ha/Family/Year.

5) The agricultural remnants and the weeds can be used as food.
6). The demands on animal and animal products is increasing due to the population increase and the increase of the consumption, as the effect of the increase of income of population.

In the PELITA VI, the Ministry of Transmigration and Forest Squatters Resettlement will develop Transmigration Settlement whose main business is Animal Husbandry. This will put the animal husbandry not as the supporting activities but will become the main source of income. In the recommended development areas (RDA) are found many lands which are potential for animal husbandry development. This program can also back up other government program, such as the program of increasing the people's nutrition and non-oil and gas export, i.e. the animal products.

Operational Definition of Animal Husbandry Model Transmigration Settlement

The main income is derived from animal husbandry

Animal husbandry is the enterprise which gives products which become the main income of the family. But this enterprise cannot stand alone and should be supported by food crops and perennial crops cultures. The integration of those cultures should be based on the concepts of profitable business, sustainable income and vigorous enterprise. The integrated agriculture whose main culture is animal husbandry should give evenly distributed income throughout the year, not much affected by economic fluctuation, but could develop well. The food crops culture should be able to supply most of the food needs of the family, especially in the early years of the settlement. The animal husbandry should be able to supply cash throughout the year, while the perennial crops (coconut, clove, cacao, fruits) will give additional income for saving.

Family man power is the main source of labour

The family will be the main source of the labour, so that each member of the family should be able to contribute for the success of the program, or this may be the constraint which should be considered in formulating the integrated agriculture model.

Suitable land for animal husbandry

Animal husbandry relatively can be carried out in many types of lands, from the fertile land up to the marginal ones. But on fertile lands, food crops and perennial crops cultures can be more competitive to the animal husbandry. Indirectly, therefore, that animal husbandry is given priority to the less or not suitable lands for food crops or perennial crops.

Sustainable market

Animal husbandry depends on market conditions, because its products usually have high value and still not be part of the daily diet of the transmigrants, so that the products have to be marketed. A sustainable market, therefore, is a prerequisite for the success of the program.

The income from farming should be US$1,000/family/year at the early years of settlement and should become US$ 1,750/family/year at the time they are handed over to the Ministry of Home Affairs

It is understood that to have income of US$ 1,000/family/year in the early years of settlement is very heavy requirement and furthermore that their main income should come from animal husbandry. One of the solution to such problems is by raising native chickens which can quickly give income. Besides that, the food crops should be able to produce enough food stuffs for the whole family. While the slower producing animals, such as cattle, sheep and goat, will be started to be raised after the grasses have grown enough to produce cuttings for the animals; or the pasture has been ready for grazing. These animals are high valued commodities which can be marketed/sold each month, so that the transmigrants have to be used to the program of saving.

In order to meet those income requirements, precise calculation should be conducted to come to the conclusion on the right size of the undertaking related to the optimum farming of different alternative but with animal husbandry is the main source of income. In formulating the optimum farming systems should be based on the followings :

- It should be assumed that the end of the fifth year of settlement, the transmigrants should already have a stable farming system and meet the targeted income.
- The analysis should be supported with calculation on the contribution and cashflow of each

subsector farmings.
- The optimum size of farming system.

Some constraints which may be faced by the transmigrants in meeting the targets are :
- The availability of man power.
- Meeting the food requirements of the family.
- Meeting the animal feeds.
- Skill in animal husbandry practices.
- Capital to start the undertaking.

Criteria For Land Suitability For The Animal Husbandry Model of Transmigration Settlement

There are some alternative undertakings for the animal husbandry model of transmigration settlement, i.e. "land based" (ruminants) or "non-land based" (fowl and pigs), or combination of those two husbandries. The "land based" (ruminants) animal husbandry will be used as the basic idea for the discussion, because it relates to the allocation of land for the transmigrants.

The very first step in starting the animal husbandry development is the selection of the most suitable lands, because this decision will affect the results of the following steps to be taken.

Some of the factors which are used as the criteria for the land suitability for the animal husbandry model transmigration settlement are the slope, temperature and agroclimate zone, soil texture, solum of the soil, soil pH and availability of plant nutrients, which can be elaborated as follows :

The slope

The most ideal land for growing grasses is, of course, the flat land without rock outcrop. But with some technologies input, the land with slope is up to 60 % still can be planted to grasses in the cut and carry system. It is recommended, however, that grazing system should not be practiced on the step land, for the danger of soil erosion.

Temperature and agroclimate

The choice of grass varieties or the kind of forage to grow should be the most suitable for the specific temperature and agroclimate of the location. There are wide range of choices for the tropical climate such as Indonesia. The same approaches apply to the choice of the animal to be raised. Dairy cattle and the sheep is suitable for the cool regions. The regions with high rainfall are less suitable for raising animals using grazing method.

Soil texture.

Soil texture is one of the most important soil characteristics which determine its fertility. The soil textures and their suitability for growing grasses are as follow :

- very suitable	: sandy loam, loam, sandy clay loam, silty loam, silt, clay loam, silty clay loam and sandy clay.
- suitable	: loamy sand and clay.
- marginally suitable	: heavy clay and silty clay.
- not suitable	: sand

Soil depth

Grasses can grow well on shallow top soil, so that grasses can take the advantage of the lands which not suitable for food crop or estate crops.

Soil pH.

The most suitable soil pH for grasses are 5.5 - 6.5, while the land with pH is above or bellow those figures can be corrected with the use of lime for the land with pH lower than the standard or using amonium sulfate fertilizer for the land with too high pH.

Soil nutrients.

The most important soil nutrients to be given attention are nitrogen (N), phosphorus (P) and potassium (K). The others are calcium (Ca) and magnesium (Mg). Nitrogen (N) is very important for plant growth and poduction of forage. Phosphorus and potassium are very important for plant growth and production of leguminous forages. Phosphorus is very important for animal growth and reproduction. Soil with low nutrient content may be corrected by fertilization.

The criteria for land suitability for pasture system of animal husbandry (meat type cattles and water buffaloes) is presented as Table 1. This table may also be used to see land suitablity for paddock system of animal husbandry. The only difference is its tolerance to the slope. Paddock system is still applicable on steeper lands.

The Needed Space

The space need for the animal husbandry model of transmigration settlement is used for general facilities, activities of the transmigrants families, supporting facilities and reserved lands.

Table 1. Criteria on land suitability for pasture system of animal husbandry

Paramater	Attribute	Land Suitability Class				
		S1	S2	S3	N1	N2
Terrain						
Slope (%) : *grazing*	s	> 3	3 - 8	3 - 15	15 - 30	> 30
: *paddock*		< 8	8 - 15	15 - 30	30 - 60	> 60
Relief (% flat)		> 60	40 - 60	20 - 40	< 20	td
Gravel land (%)		< 5	5 - 10	10 - 25	25 - 50	> 50
Rock outcrops land (%)		0	< 5	5 - 25	25 - 50	> 50
Temperature	t	24 - 28	28 - 30	30 - 33	> 33	n.a.
			20 - 24	16 - 20	< 16	
Agroclimatic Zones :	c	C1, C2, C3, D1	D2, E1, E2	B3, C4, D3	B2, D4, E3, E4	A, B4
- cattle (meat type) [a]		A, B1, B2	B3, C1, C2	C3, D1, E1, E2	C4, D2, D3	D4, E3, E4
- Water Buffaloes						
Rooting conditions	r					
- Soil drainage class		mw, w	sp, p, se	vp, p	e	n.a.
- Texture of the top soil		SL, L, SCL, SiL, Si, CL, SiCL, SC	LS, C	HC, Sic	S	n.a.
Depth of soil (cm)		> 50	30 - 50	20 - 30	10 -20	< 10
Soil nutrient retension of the top soil	f					
- KTK (me/100g soil)		> 16	< 5	< 5	n.a.	n.a.
- pH (H2O)		5 - 6,5	6,5 - 7,0	7,0 - 8,0	8,0 - 8,5	> 8,5
			4,5 - 5,0	4,0 - 4,5	3,5 - 4,0	< 3,5
Availability of nutrient in the top soil layer :	n					
-Total - N		> 0,2	0,1 - 0,2	<0,1	n.a.	n.a.
- Available P2O5 [b]		m	l	vl	n.a.	n.a.
- Available K2O [b]		m	l	vl	n.a.	n.a.
Toxicity :	x					
- Salinity		< 3	3 - 5	5-8	8 - 10	> 10
- Aluminium (%)		-	-	-	-	-
- pyrite/cat clay (1,5%) cm		> 100	75 - 100	50 - 75	25 - 50	< 25

[a]Oldeman system: not applicable for cattle of milk type

[b]m = medium; l = low; vl = very low; n.a. = not applicable

ISSN 01260 - 4400

General facilities

The general facilities are usually concentrated in the centre of the settlement area. The space needed for these general facilities is about 0,25 Ha/family which are divided into different uses as presented on the Table 2. Allocation should be given for further development (in the form of reserved lands).

Activities for the transmigrants families.

he space which should be allocated for the activities of each transmigrant family is the land which can be cultivated to have guaranteed income for their welfare. The needed space is divided for the following :

1. **Houselot.**
   Houselot is the land surronding the transmigrants house which can be cultivated to support the family income. On this houselot, there may be a paddock with a place to pile the manure and the remnant of the feed, a bin to store the feed, a bin to store the feed, a bin to store agricultural produces, toilet-bathroom-washing space, land for home gardening (vegetables, medicinal plants, fruit trees, coconut, etc). Its border may be planted to useful plants (coconut, leguminous plants as a source of forage. The size of the houselot for each family is 0.5 Ha.
2. **The land for food crops cultures.**
   This land will be used to plant food crops (rice, secondary crops, tuber crops, etc). This land is expected to give yields in the first year of the settlement and will continually produce enough food stuffs for the family. The level of the family income which can support the proper life of the transmigrant family should be at least 360 kg rice equivalent/person/year. Assuming that each family consists of 5 persons, their income should be 1,800 kg rice equivalent/family/year, or about Rp. 900,000,-. Referring to the standard, that the income in the first few years of the settlement is US$ 1,000,- or ± Rp. 2,150,000,-/family/year, should be able be derived from cultivating the houselot garden and the food crop lands, including animal husbandry. The size of the food crop land is 0.5 Ha/Family.
3. **Forage land**
   The need for growing forage plants depend on the number of the animals being raised and the kind or the grasses to be grown. For a cattle weighing 350 kg whose main feed is the elephant grass will need forage land of the size 650 m²/head of the P.O. cattle which is based on the following calculation :
   1) The forage need = 10% x 350 kg = 35 kg forage/day or 12,740 kg/year (rounded up to 13 ton/year)
   2) Sampling method the elephant grass production with 40 day interval of cutting = 5 kg/m². The real production is therefore, = 50% x 5 kg = 2,5 kg/m².
   3) The real production in a year = 8 x 2,5 kg = 20 kg/m².
   4) The land needed = 13,000 : 20 = 650 m².
   5) A hectare of the grass land can support 10,000: 650 = 15 heads.

   Those calculations are based on the assumption that the grass land is well managed with precise cutting intervals. But the introduction of animal husbandry in the transmigration settlement still have to be done phase by phase.

The spatial need for the supporting facilities.

The supporting facilities which serve the public (usually at the outside of the settlement centre) are :

a. Public cemetary
b. Village owned land
c. Demonstration Plot Farm
d. Public grazing land : 0.25 Ha/fam *)
e. Road network (axis road, connecting roads, village roads) which corresponds to the local specific needs.

*) The public grazing land is communal one, e.q. for a group of 50 families will be given a piece of 12,5 Ha grazing land.

Reserved land

The reserved land is meant for accommodating the future development. This land can be used for the development of new houselot, new agricultural lands, or for industrial activities and to be conserved. The size of the reserved lands is calculated as 0,5 Ha/family.

Based on the spatial analysis, the animal husbandry model of the transmigration settlement, the needed lands are presented on the Table 3.

Subsidy on Agricultural Inputs, Animal Living Security Supports

The transmigrants are usually weak in the capital generation, the government subsidies are very much needed to support the success of the animal husbandry model transmigration settlement. The

Table 2. Detail list of facilities on the general facility land (in the centre of the settlement)

No	Facilities	Big UPT (350-500 Fam)	Small UPT (150-350 Fam)
1.	Village Conference Building	1.500 m^2	1.000 m^2
2.	Games courts	40.000 m^2	40.000 m^2
3.	Buildings for praying	5.000 m^2	2.500 m^2
4.	Kindergarten	1.000 m^2	1.000 m^2
5.	Primary School	10.000 m^2	10.000 m^2
6.	Secondary School	10.000 m^2	-
7.	The House for the School Head	1.000 m^2	250 m^2
8.	The House for the Teacher (Twin)	1.750 m^2	1.000 m^2
9.	The House for the School Watchman	750 m^2	250 m^2
10.	Infirmary	-	250 m^2
11.	Public Health Centre	450 m^2	-
12.	The House for the Nurse	250 m^2	250 m^2
13.	The House for the Head of the Settlement Unit	250 m^2	250 m^2
14.	The House for the Transmigration Officials (Twin)	250 m^2	1.250 m^2
15.	The House of the Transmigration Settlement Unit	250 m^2	250 m^2
16.	The Unit go down building (Agric. input)	1.400 m^2	800 m^2
17.	Post Office and Indonesia Rural Bank Buildings	400 m^2	-
18.	Market and Stores	4.000 m^2	750 m^2
19.	Public Transportation Terminal	20.000 m^2	-
20.	Plaza	40.000 m^2	20.000 m^2
21.	Animal Market	1.500 m^2	1.500 m^2
22.	Animal Health Centre and Artificial Insemination Centre (Service and Extension Centre)	1.000 m^2	1.000 m^2
23.	Go down for keeping the hay needed at the animal market	500 m^2	500 m^2
	Total	141.750 m^2	82.000 m^2

Table 3. The standard size of land for transmigration settlement with animal husbandry model

Land Uses	Size of the land(Ha / Farm) [a]
General facilities	0.25
Houselot	0.50
Agricultural land	0.50
Forage Crops land	1.00
Reserved lands	0.50
Total	2.75

[a]Excluding land for supporting facilities.

subsidies are very much needed in the first few years of the settlement, in the form of agriculture production inputs, animals to be raised and living securities. The subsidies are in the following forms.

Agriculture production inputs and the animal.

The subsidies should be given in the form of :

a. Paddock

a.1. The forms and the measurements of the cattle paddock.
The forms is the two row plans and one control alley its measurements are:
- Nature cattle : 2 m x 2.5 m/head , for 10 heads.
- Calves : 1.5 m x 2.0 m/head, for 10 heads
- Go down for storing the feed : 3 m x 8 m
- Go down for storing fertilizers and implements : 3 m x 4 m.

a.2. The forms and the measurements of the sheep/goat paddock.
The form is raised floor buildings.
The measurements are :
- Mature sheep/goats :1.25 m x 1.5 m/head
- Lambs : 1.0 m x 1.2 m/head
(A building can accomodate 30 breeds and 60 lambs).
- Feed godown : 3 m x 5 m

b. The implements

- Hand hoe : 2 pieces
- Sickle : 4 pieces
- Ropes : 100 m
- buckets 20 l/10 l
- Wheel burrows
- Grass fork
- Coconut leave rib broom.

c. Animal health facilities.

- Vaccines : Ak, SR, Anthrax, TBC, ND, Chicken pox.
- Medicines :Against Worms, antibiotics, sulfacarbachol, and others.
(Those facilities are better available at the village animal health centre).

d. The breeds and forage seeds

- The animals which are ready for mating or they have been pregnant.
- 5 heads of cows / family and one bull / 2 families
- Food crops seeds and perennial crops seedlings.
- Grass seeds / stolons.
- Instruments and materials for artificial insemination (available at the village animal health centre).

e. Plants culture inputs

- Fertilizers
- Pesticides
- Silos

Living security subsidies

The living security subsidies are given for the first year of the settlement for the following reasons :

(1). During the first year of settlement, the transmigrants are still concentrating on cultivating the land for planting food crops and perennial crops, which still cannot produce enough yields to meet their needs.

(2). In the second year after their arrival, their minimal living needs may be met from food crops cultures (0,5 ha agricultural land) and from the local bred chickens they are raising.

(3). In the third year, the ruminant animals may be distributed / introduced to the transmigrants and the needed forages are already available.

(4). In the fourth year, the animal (cattle or goat/sheep) husbandry may have produced offsprings.

(5). In the fifth year, the transmigrants are already able to start paying back to the investor who lent the animals.

The Animal Husbandry Activities in the Transmigration Settlement and the Animal Husbandry Model of the Transmigration Settlement Which Being Planned

The animal husbandry model of the transmigration settlement will be executed in the sixth five year development plan, while the animal husbandry activities which are going on the transmigration settlement are mostly still in the form of supporting activities to the models which are being developed. To give information on the animal husbandry activities which are going on and will be executed in the transmigration settlements, three examples at three different locations are presented below:

Animal husbandry model of the transmigration settlement at Barumun, North Sumatra Province.

Settlement planning had been carried in the fiscal year 1994/1995 and settlements will take place in the fiscal year 1995/1996. The breeds which will be developed are the Hair sheep, Gurnet and the Big Tail. The grazing in the paddock pasture system will be used, with sometimes are kept in the paddock (have to be fed).

The Barumun location can accomodate 200 transmigrant families. Each family will be entitled to 2 Ha pasture land and 0.25 Ha houselot. The 2 Ha pasture land is in a piece of land, so that management is practical and efficient. The pasture land will be divided into 4 blocks of 0,5 Ha each. The sheep will be kept for one week in each block of the pasture. The pasture grass will be *Paspalum dilatatum* and *Brachiaria humidicola*. The carrying capacity is 100 - 200 heads of mature sheep for the whole of 2 Ha pasture.

The extension to the transmigrants will follow the methods used in the NES system, consisting of 3 phases :

1) Consolidation phases (year 1 - 3).
   The transmigrants will be guided and given extension in the sheep husbandry. Each family will be given credit of 16 heads of sheep breeds (15 heads of ewes and 1 head of the bull sheep, all are ready for mating). This phase will last for 2 years.
2) Development phase (year 3 - 5).
   The transmigrants are assumed to have gained experience and skill, so that additional 16 heads of the sheep breeds (15 heads of ewes and 1 head of the of the bull sheep) to each family, so that there will be 32 heads of cattle in each family.
3) Sustainable phase (year 6 - 9)
   Extension should be continually given to the transmigrants on the aspects of the animal production, animal breeding, marketing and cooperation with other enterprises.

The production, selling of the offsprings and the development within 10 years period can be projected by the schedule of the animals are recieved and the production management of the sheep, as presented in the Table 4.

Some of the main activities which can be seen and analized on the Table 4, among others are

a) The number of the offsprings which are still alive up to the age of 16 month (ready for delivery).
b) The number of the lambs are sold.
c) The schedule of the additional breeds.
d) The schedule of the replacement stock.
e) The number of breds and the ewes at the early and end of the period.

The assumptions used in formulating the projected sheep productions, among others are:

a. Survival rate of the ewes is 120 %.
b. The ewe delivery is done at the age of 16 month old, which should have weighted 25 kg for the female and 30 kg for the male.
c. The start and the additional sheep bred is done in phases, i.e. in the year I (month 3 - 4) 16 heads are given for a family and in the year II (mounth 35) are added 16 heads more for a family.
d. Replacement stock program will be carried out after the VI births at the second month of the weaning period, so that at the third (last) month of the weaning period, the new ewes are ready for mating.

Based on those assumptions, the delivery of the new lambs will be carried out in the year III, i.e. the month 25th and the month 33rd, with 36 heads ready for selling. Based on the birth cycle of 3 times in 2 years, there are some years whose 3 births and others have only 2 births. Two births happen in the year III, V, VII and IX, while in the other years (year IV, VI, VII and X) there will be only one birth in each year.

The sheep population is growing very fast since the end of the year IV and V, with the addition of 18 heads/year/family. Further development is relatively constant with the size of the head in a family at the end of each year will be 104 heads. The increase of the sheep population will also happen during the

Table 4. The projection of production and selling the sheeps

Item	Year/Month																					
	I			II			III		IV			V		VI			VII			X		
	3/4	9	17	25	33	35	41	49	51	52	57	65	73	81	82	84	49	97	99			
Sheep (Breed) :																						
Ewes	15	15	15	15	15	15	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Mate	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Lamb																						
Living herd																						
Just After Birth	-	-	18	18	18	18	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Age 8 - 10 months	-	-	-	18	18	18	18	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Age 16 months	-	-	-	18	18	-	18	18	-	-	36	36	36	36	-	-	36	36	-	-	36	36
Lambs sold	-	-	-	18	18	-	18	18	-	16	36	36	36	36	-	16	36	36	-	16	36	36
Additional breeds	-	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Replacement Stock	-	-	-	-	-	-	-	-	16	-	-	-	-	-	16	-	-	-	16	-	-	-
Early stock	16	16	34	52	52	52	68	86	104	120	104	104	104	104	104	120	104	104	104	120	104	104
End Stock	16	34	52	52	52	68	86	104	120	104	104	104	104	104	120	104	104	104	120	104	104	104

ISSN 01260 - 4400

replacement stock period with the new breed, i.e. in the year V, VII and IX for a period of 1 - 2 month when the meaning period have to ended by the old breds. The old bred will be sold as the culled sheep.

The labour needed to care for the animals and to produce forages in the first 3 year will be between 209 up to 264 man days/year and will be 401 - 531 man days/year after that. The needs can be met by the family labors and there will be still be excess of 216 - 297 man days/year/family in the first 3 years period and 100 - 213 man days/year/family in the year IV - VII, and 249 386 man days/year/family in the year VIII - X. The transmigrants, therefore, still have time to cultivate the food crops.

The cash flow which is made shows that there are deficits during the first five years period and profit will be obtained since the year VII, amounted to Rp. 2 million up to more than Rp. 5.5 million/year/family.

Integrated animal husbandry model transmigration settlement at Honggoruru, East Nusa Tenggara Province

The settlement planning for the integrated animal husbandry model transmigration settlement had been carried out in the fiscal year 1994/1995 and settlement will be recruitment in 1995/1996. The model will consist of the development of food crops, estate crops and animal. The food crops which are going to be planted and the houselot (0,5 Ha including for the house building) with rice, peanut, soybean and cassava), while the estate crop will be the present 1 - 2 Ha cashew nuts which have been planted. The Honggoruru location can accomodate 400 transmigrant families.

The animals which will be cared of is Ongole Cattle. Each transmigrant family will receive 2 heads of cattles (1 cow to be raised for its offspring and one bull for fattening program). The forage will be supplied with elephant grass to be planted on an area of 0.5 Ha. Thus there are 2 systems used in this animal husbandry program, i.e. breeding system and fattening system.

The breeding system will follow the Sumba contract system. Each family will receive a head of cow of 2 years old, and within 5 years of husbandry the transmigrants has to pay back (to the government or investor) 2 heads of its offsprings aged 2 years.

It is proposed to speed up the paying back of the loan by giving the first offspring (calf) and the third one. The second offspring which will be delivered in the year III will become the transmigrants asset. By the year VIII the transmigrants will already have 4 heads of cattles, consisting of the original bred and 3 calves from the 2nd, 4th and 5th births. The number of the cattle which will maintain are 3 - 4 heads/family to match the size of the available pasture.

The fattening program for the first 4 years will be based on the sharing basis. The transmigrants will receive half of the price difference between the original value and the selling price. The fattening program will use bulls of the 2 years old. The duration of each fatting cycle is 6 months. At the first phase of the program, each family will receive only 1 head of bull for fattening, but after the transmigrants are becoming for skillfull, they may care 2 bulls in a fattening cycle. By the year V the transmigrants may be able to do fattening one bull of his own and another one on the sharing basis; and by the year X the transmigrant has been fattening 2 bulls of his own.

The reasons for developing animal husbandry using combined breeding program and fattening program are :

- The husbandry is easy and can be carried out by the beginners.
- Marketing is no problem
- High productivity can be obtained by technical extension.
- There is by product of manure which is very good for increasing the agricultural soil fertility.

To guard against the non profitable risk, there should be a written contract between both parties, i.e. the transmigrant and the lender (investor/ government), in order the transmigrant will be more responsible to the program.

Feeding for the breeding model will mostly be given by letting the cows graze on the pasture during the day and in the evening they are kept in the barn, and are given additional feed of the agricultural waste such as corn stalks, rice stalks, peanut plants and cassava leaves which are usually available during March - April.

To increase the productivity of fattening system, both in the per day weight increase of a cattle and the number of the cattles which can be put in the system in a year, the year around enough supply of the needed forages should be able to be produced from the allocated land. The elephant grass (*Pennisetum purpureum*) is recommended to be grown, for its high productivity and has no detrimental effect if it is cut late.

Table 5. Transmigrant family income receiving credit for the combined 2 models

Year	Family Income		Family Expenditures	Saving	
	A	B		A	B
	(1)	(2)	(3)	(1) - (3)	(2) - (3)
1	624,078.7	631,600.4	742,800	(118,721.3)	(111,199.6)
2	734,107.4	573,094.4	787,368	(53,260.6)	(214,273.6)
3	1,136,956.7	1,037,555.8	834,610	302,346.7	202,945.8
4	2,293,979.2	3,601,119.2	884,687	1,409,292.2	2,716,432.2
5	3,460,207.9	4,845,776.4	937,769	2,522,438.9	3,908,007.4
6	2,053,040.4	3,521,743.0	994,034	1,059,006.4	2,527,709.0
7	2,125,342.8	3,682,167.5	1,053,676	1,071,666.8	2,628,491.5
8	3,941,503.4	5,591,737.6	1,116,896	2,824,607.4	4,474,841.6
9	5,897,981.3	9,930,227.2	1,183,910	4,714,071.3	8,746,317.2
10	6,240,100.2	9,454,333.9	1,254,945	4,985,155.2	8,199,388.9
11	6,271,006.2	9,678,093.9	1,330,242	4,940,764.2	8,347,851.9
12	6,310,466.5	9,921,979.5	1,410,056	4,900,410.5	8,511,923.5
13	6,767,294.5	10,595,498.3	1,494,660	5,272,634.5	9,100,838.3
14	7,746,245.9	12,364,035.6	1,584,339	6,161,906.9	10,779,696.6
15	7,814,040.6	12,708,897.7	1,679,399	6,134,641.6	11,029,498.7

Note : A = Owning 1.0 Ha cashew nut plantation
B = Owning 2.0 Ha cashew nut plantation

Table 6. Transmigrant family income non receiving credit for the combined 2 models

Year	Family Income		Family Expenditures	Saving	
	A	B		A	B
	(1)	(2)	(3)	(1) - (3)	(2) - (3)
1	655,557.0	694,557.0	742,800	(87,243.0)	(48,243.0)
2	936,460.4	977,800.4	787,368	149,092.4	190,432.4
3	1,280,178.0	1,323,998.4	834,610	445,568.0	489,388.4
4	1,771,123.1	2,555,407.2	884,687	886,436.1	1,670,720.2
5	2,905,980.5	3,737,321.7	937,769	1,968,211.5	2,799,552.7
6	1,465,559.4	2,346,780.9	994,034	471,525.4	1,352,746.9
7	1,502,612.9	2,436,707.8	1,053,676	448,936.9	1,383,031.8
8	3,281,409.7	4,271,550.2	1,116,896	2,164,513.7	3,154,654.2
9	4,685,062.9	9,504,440.5	1,183,910	3,501,152.9	8,320,530.5
10	4,954,406.7	6,882,946.9	1,254,945	3,699,461.7	5,628,001.9
11	4,908,171.1	6,952,423.7	1,330,242	3,577,929.1	5,622,181.7
12	4,865,816.3	7,032,769.1	1,410,056	3,455,760.3	5,622,713.1
13	5,236,013.0	7,532,935.3	1,494,660	3,741,353.0	6,038,275.3
14	5,899,130.0	8,669,803.8	1,584,339	4,314,791.0	7,085,464.8
15	5,856,097.8	8,793,012.0	1,679,399	4,176,698.8	7,113,613.0

Note : A = Owning 1.0 Ha cashew nut plantation
B = Owning 2.0 Ha cashew nut plantation

Leguminous plants as additional forage (lamtoro, turi or siratro) may be planted around the forage plots and around the houselot. The grasses are planted in the early wet season before the arrival of the cattles, so that by the time the transmigrants receive the cattles, enough supply of forages are already available.

The production of the elephant grass is estimated about 6 ton/Ha/cutting, so that during a cycle of fattening period 0.5 Ha x 5 ton x 4.5 cuttings = 13.5 ton/cycle forage can be obtained. The forage need of a cattle is 25 kg/head/day or 25 kg x 180 day/cycle = 4.5 ton/head/cycle. This means that there is still excess forage production which is available for the breeding cattles.

The size of the stable and the number and kinds of the implements needed are in accordance with the system used :

1) The stable for breeding system should be able to accomodate 3 - 4 cattles (in a family); there should be separation among the breeds, the young calves and young cattles.
2) The stable for fattening system should be able to accomodate only 2 cattles which are being fattened (in a family).
3) A mating stable is provided with guarding rail.

Those stables should be built before the arrival of the cattles on the houselot near the house, so that control and safety measures can be done easily.

The animal husbandry model should be developed as a group activities of about 20 families in order extension given by the official in charge can be done easily and more effective. Such establishment may be developed to become a strong village unit cooperative.

This integrated animal husbandry model (houselot cultures, cashew nuts culture and animal husbandry with good and enough source of clean water), the transmigrant income may be developed as follows. Their income will be negative in the year 2 - 3, because some of their incomes hould be allocated for paying back the credit for the development of the cashew nuts, while the cashew nuts production is still low, not enough to cover up the payment of the credit. The total income of the transmigrants depend on the establishment they engage in, and the best 4 combinations of activities which may give high income in each development stage are :

- Food crop cultures + 1.0 Ha cashew nut *with* credit + animal husbandry having enough of clean water supply.
- Food crop cultures + 2.0 Ha cashew nut *with* credit + animal husbandry having enough clean water supply.
- Food crop cultures + 1.0 Ha cashew nut *without* credit + animal husbandry having enough clean water supply.
- Food crop cultures + 2.0 Ha cashew nut *without* credit + animal husbandry having enough clean water supply.

The income of the above mentioned 4 models are presented on Table 5 and 6. Those tables show that during the first 2 years, the transmigrants who use credit and who are not having credit, are still have negative income. But in the year 4 and 5, the trans-migrants who use credit have higher income than their fellow who are not having credit.

In the year 5, the income of the transmigrant who use credit and owning 1.0 Ha of cashew nut crop is about Rp. 3.5 millions, while they who own 2.0 Ha of cashew nut crop have income of about Rp. 4.8 millions. On the other hand, the transmigrants who do not get credit and owning 1.0 Ha of cashew nut crop could get income of only about Rp. 2.9 million, while they who own 2.0 Ha of cashew nut crop would have income of about Rp. 3.7 million.

In general, the transmigrant income will be increasing continuously up to the year 15. The transmigrants who own 1.0 Ha of cashew nut crop and non credit users will have income of about Rp. 5.8 million compared to about Rp. 7.8 million income of those who use credit. The income difference for the transmigrants who own 2.0 Ha cashew nuts will be about Rp. 8.7 millions and Rp. 12.7 millions, respectively.

Sheep husbandry as supporting activities in the Sosa II transmigration settlement, North Sumatra Province

The Sosa II transmigration settlement was originally planned as the estate crop model. The number of the transmigrants are 500 families (2,077 persons) who were settled in 2 periods, i.e. 154 families in the fiscal year 1990/1991 and 346 families in the fiscal year 1991/1992. Each family was entitled to a total of 2.5 Ha of lands consisting of 0.5 Ha houselot and 2.0 Ha estate crop land (plasma). There are 80 families (16 %) out of those 500 families have been developing sheep husbandry as the supporting establishment of the oil palm main crop.

The animal husbandry model being practiced in Sosa II is on lease basis. The terms are that a transmigrant family will receive adult 5 breeds and one male and within 3 years period, he should submit / pay back 10 ewes or twice the number of the breeds he has received, and another one bull sheep.

The sheeps are kept in the houselot (0.5 Ha/family). Part (0.4 Ha inclusive the housing land) of the houselot is planted to food crops and the rest (0.1 Ha) is used for the stable and for planting the forages.

The size of the stable is 6 m^2 (2 m x 3 m) and it is located about 10 m from the house building and from the well. The stable is floor lifted model and there should be compartments for each physiological age group. The material used should be of locally available ones such as, the roof is made of palm leaves, the floor is of local wood, the wall is of local wood or bamboo.This stable can only accomodate 9 heads of adult sheep, so that if this husbandry can develop well, the transmigrants should enlarge the stable accordingly.

The development of sheep population at Sosa II is relatively good. In last August 1993, each family was, at the average, able to increase their herd from 5 breed and 1 male at the start of the project, to a total of 8 - 13 heads (male and female), as can be seen on Table 7.

The highest mortality happened in June, which was mostly caused by the Ca-deficiency in the forages. The breeds and the lambs were very weak after the delivery. The breeds were not able to give milk to the offsprings. Both animal could easily succumb to different kinds of diseases.

One of the effort which was carried out to reduce those problem is giving extension to the transmigrants on good and proper animal feeding.

The sheep husbandry is using semi-intensive system, i.e. feeding system, and sometimes are let loose for a while on the paddock, so that they could have some exercise. The feeding is done by cut and carry method, so that the transmigrant should be active to supply the feed.

The feed is of different kinds of material. The main menu is Paspalum dilatatum grass which should be planted on the houselot and also on the edge of the contours. The additional feed is leguminous plants (legume tree) which are planted along the border of the houselot, and to increase feed nutrients, should also be given concentrate (of palm oil residues) and a little minerals.

The palm oil residues are by product of the palm oil plant, i.e. kernel cake and the oil residues. These by products still have high protein and organic matter content.

Field observation revealed some improvement still have to be done on :

- The fertility of the grass plants.
- Uniform coverage of the grassland.

The effect was that, grasses had to be taken from other places around the plasma lands. Since the herd is increasing in size, this will not be able to meet their forages needs from the allocated grassland and resulting to the problem in reaching the targeted weight of the animal.

The *Paspalum dilatatum* grass can produce 90 ton forage/Ha/year, and on 0.1 Ha of land means 9 ton of forage/year can be available. The average forage need of the sheep is 7 kg per day or 2,555 kg in a year. This means that the 0.1 Ha forage cropland can support 3.5 heads of sheeps, far from the number of the sheep a family has to raise. It is, therefore, suggested to reconsider the standards which had been decided.

But the field observation showed that sheep husbandry at Sosa II was developing relatively good. This might be due to direct supervision given by the Sei Putih Animal Husbandry Sub Research Station on both technical husbandry and on the management of the establishment, beside the supply of forages collected from the surrounding plantation.

Besides the routine guidance and extension given, the background of the transmigrants was very important in the success of the establishment. The transmigrants who had experience as an animal husbandry man or ever had raised animals in their original places could have better performance, because all the advices were followed seriously.

Most of the participant transmigrants worked as the farm labourer at the PTP farms or at some other private estates farms which were located near the transmigration settlement areas. The time spent at the estate farms were relatively long (hours 08.00 - 16.00 or 8 hours per day with salary at Rp. 2.000 - Rp. 3.000. The development of sheep husbandry using leasing model was proofed to be beneficial in supporting the transmigrant income which was at present relatively low.

Although the working day in the estate farms was long, the transmigrants were still be able to raise sheep relative well, because the husbandry could be done by his family members (wife and children).

Table 7. The development of sheep population at SOSA II, North Sumatra

Month	Adult		Offspring		Death				Number of Live Animal
	Male	Female	Male	Female	Male		Female		
					Adult	Lamb	Adult	Lamb	
January 1993 (arrival)	80	400	-	-	-	-	-	-	400
April	80	399	59	21	1	1	7	1	544
May	79	394	10	15	-	-	6	-	573
June	78	390	25	37	3	5	6	2	624
July	76	379	85	37	-	2	2	1	730
August									
Total	76	379	179	110	4	8	21	4	730

The works which should be done in sheep husbandry are :
- Cut and carry the forages
- Cleaning the stable
- Observation of the animal development.

The income level which was received from the sheep husbandry for the time being cannot be analysed, because there was no selling of the offspring yet. But income projection had been made. In the year 3, the size of the herd in a family will be 27 heads (males and female), but the transmigrant has to roll (pay back) 10 ewes and 1 male, there will be 16 heads left as his own property. If the average value of each head is Rp. 65,000,- the total income at the year 3 is 16 x Rp. 65,000,- = Rp. 1,040,000,-. In the year 4, the transmigrants is expected to be able to sell some of the offsprings.

To reach the income target of US$ 1,750 or Rp. 3,500,000,-per family per year in Pelita VI, the recomended scale of the establishment should be 50 ewes and 5 males. Using the same system, in the month 17 and every 8 months after that, the transmigrant can pay back the lease with 26 heads. Beside that he still be able to sell 14 heads to the nucleus / investor or at the open market. If the value of a head is Rp. 65,000,-, before the lease/credit has been paid back, the transmigrant will have income of 14 x Rp. 65,000,- = Rp. 950,000,- or Rp. 75,000,- every month. But after the lease / credit has been fully paid back, he can sell regularly 40 heads every 8 months or at the average 5 heads every month. This is equivalent to Rp. 325,000,- per month or Rp. 3,900,000,- per year, which is already beyond the target income of the Pelita VI.

The recommended establishment is relatively big, so that with such high income may mean that the sheep husbandry is the main establishment to be carried out. All the available man power or family labour will have to be dedicated to this sheep husbandry especially in feeding the animal or in supplying the needed forages.

Theoretically, the sheep husbandry using Sosa II model is feasible to be carried out for 2 reasons :
1) The income level is relatively high.
2) Demand of the product is high.

The income level of the transmigrant in the year 3 will be Rp. 1,040,000 / year or Rp. 86,000 / month. The income in the following years will continuously increasing in line with the increase size of the herd. It is expected that in the year 4, the income from this sheep husbandry will be 24 x Rp. 65,000 = Rp. 1,560,000 / year or Rp. 130,000 / month (the asset value). If some of the animals will be cared to be the breeds, there will be 9 heads available for the market and will give cash of 9 x Rp. 65,000 = Rp. 585,000/month.

The demand of the product is good, both locally and for export to Malaysia or Middle East countries. But 2 technical aspects which need attention are :

1. The availability of lands for growing forage and building the stables.
2. The continuous availability of good breeds.

The forage land should be available enough to produce forage for the whole herds. If not the supply of the forages will not only be labour consuming but also may be of low quality, which consequently will affect the animal productivity.

A source of good breeds should be near to the location where the development will be carried out. If we always take the breed from Java, it will mean higher price for the more expensive cost of transporting them. The solution is to develop breeding centre nearby the place of the development.

Conclusions

It can be concluded that Animal Husbandry Model of Transmigration settlement shows prospect to be developed in the transmigration settlement, either as the main establishment or as the supporting activities. As the supporting activities, the sheep husbandry at the Sosa II NES - Transmigration Settlement Unit Could fairly increase the transmigrants income besides producing manure which is very useful for crop cultures in the houselot.

Based on the availability of the labour, land, desire and propelled by the transmigrant low income, the sheep husbandry at the Sosa II Transmigration Settlement Unit can develop well. Besides the above mentioned aspects, other aspects such as, topography of the location, soil type, rain fall, weather, social and culture, infrastructures and other supporting factors can contribute to the success of the program.

The model which is being tried is the lease system with the animal / sheep rolling system, so that can give another opportunity to the other transmigrants to have a chance to get benefit from the sheep husbandry system. This rolling system will also have impact to speed up the increase of the sheep population.

In the presence of the sheep husbandry development, the income level of the transmigrants is slowly increasing in line with the increase of the number of the sheep the transmigrants keep and can depend upon the situation when the price of the palm oil is decreasing or there is price fluctuation.

The supply of feed concentrate and other animal production means need special handling. Continuous supply has to be managed by certain organizations, such as Rural Cooperative Unit, animal husbandry man group or other institution which is agreed upon by the transmigran.

To reach the establishment level as the supporting establishment, the size of the leased sheeps consisting of 5 ewes and one male is the minimal size of the flock. It is recommended that the size of the flock can be increased, because the market demand is good. The number of 50 ewes and 5 males may bring the income level up to the Pelita VI target, i.e. US$ 1,750 or about Rp. 3.5 million per year per family.

The size of the land for establishment should meet both objectives of the sheep husbandry development, i.e. as a supporting activities or as the main sources of the transmigrant income, and should be based on the optimum size of the head that could become a sustainable development. While the carrying capacity of the land which should be prepared has to be accurately calculated to meet the maximum need of forage at the peak number of the herd for it may affect the animal growth and opportunity for further development.

It is strongly recommended to get an investor involved in the project, either as the financing institution or as market guarantor, through mutual cooperation which may increase the transmigrant level of living.

Before establishing the sheep husbandry, the continuous big supply of breeds and their transportation should be considered. The day to day presence of the extension staff is very necessary. Those are important in all the animal husbandry establishment, for its success depends on the diligent and resolute animal husbandryman and sensitive to the change of the environmental conditions.

Since most of the transmigrants are economically weak, the development of animal industry in the transmigration settlement, therefore needs the help either from the government or the investor; so that the transmigration settlement may become an animal industry territory. The establishment model which will be developed is the cooperation between the transmigrants (as the animal husbandryman), an enterprise (as the investor and marketing manager), and the government (as the facilitator and controller).

The cooperation should be mutual in order to meet the following objectives :

a. The government program can be carried out (particularly the Ministry of Transmigration and

Forest Squatters Resettlement and the Ministry of Agriculture).

b. The target income of the animal husbandry transmigrants can be reached.
c. Profitable to the investor.

The following four important aspects need to get attention for the success of the execution of the animal husbandry model of transmigration settlement

a. The arrival of the transmigrants should be on time, so that in the first year, their agricultural lands can already give production.
b. The living securities should be fully given in the first year of their arrival.
c. The arrival of the animals should be on the time when the forage has been established and ready for harvesting.
d. The animal husbandry facilities should include the need for the animal health.