

## **Research and the development of improved small ruminant production systems in Vietnam**

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### **Summary**

Small ruminants (mainly goats) have been raised in extensive grazing systems in Vietnam for many years. Goat production is popular in mountainous areas and is considered to be a self-sufficient system with low productivity. In recent years, more attention has been paid to small ruminant production by farmers and Government agencies and has been considered as a means to improve the income of the rural poor. Some progress has been made in the field of breeding, nutrition, processing and prevention of diseases. The population of small ruminants has increased over the last 15 years from 320,000 heads in 1990 to 1,021,000 heads in 2004, an average annual rate of increase of about 15%. During this time, the price of goat products has increased to from 8,000 to 35,000 VND/kg liveweight and from 5,000 to 9,500 VND/litre of goat milk. Local indigenous breeds, Bachthao goats and Phanrang sheep, have been found to perform well under improved management conditions. Some milk goat breeds have been imported from India (Beetal, Jumnapari, Barbari) and USA (Saanen, Alpine) with a view to cross with local goats to improve milk production and body size, and Boer goats have been imported to improve meat production in local goats. A series of studies using local feed resources and strategic disease control measures was carried out in the context of developing sustainable and integrated small ruminant farming systems. These studies have showed that up to 35% improvement in productivity can be achieved by such techniques. Some programs and projects have been carried out with the joint support of the Vietnamese Government and international organisations and have resulted in highly successful outcomes. The FAO Eduard Soumar Award on developing goat production was presented to the Vietnam TCP project in 2001 by FAO Rome. It is clear that small ruminant production can play an important role in improving the incomes of poor farmers in the hilly and mountainous areas. This review discusses the present situation and some of the research findings in GRRC research over the past 10 years, and proposes that the current research activities should now be extended into central and South Vietnam as means of increasing farmers' incomes and alleviating hunger and poverty in these areas of Vietnam.

*Keywords: goat milk, meat production, goat breeds in Vietnam, population change, prices, nutrition, feed resources, development strategies*

### **Introduction**

Vietnam is tropical country with a monsoon climate located in Southeast Asia. The total area of the country is 33.2 million ha, with a population of 84 millions. There are 52 million farmers, and 67% of the total labour force are working in the agricultural sector. However, the cultivated area is small, about 11 million ha. Agriculture is based mainly on rice production, with 37 million tons per year, grown on 77% of the cultivated area and supported by other crops such as maize, potato, cassava, groundnut, soybean, sugarcane, fruit trees and other perennials and commercial trees such as coffee, tea, rubber and coconut. The agricultural output value accounts for 25% of GDP, of which food production constitutes 77% and livestock production 20% (mainly pigs, cattle, chickens, ducks and goats). At present rice production in Vietnam is more than enough for consumption and 3.9 to 4 million tons per year are exported, making Vietnam the second largest rice exporter in the world.

Small ruminants (mainly goats) have been raised all over the country for a long time in extensive systems with low productivity. However, in recent years, more attention has been paid to small ruminant production by farmers and Government. Some achievements have been made in the fields of breeding, nutrition, processing and disease prevention. Some programs and projects have

been carried out with the support of Government and international organisations that have has an impact. It is clear that small ruminant production is playing an important role in improvement of the incomes for poor farmers in the hilly and mountainous areas and is contributing to poverty and hunger alleviation in Vietnam.

*Table 1. Livestock population and production trends*

	Population 1000 heads 2000	Growth rate, %/year 1990 - 2000	Population 1000 heads 2004	Growth rate, %/year 2000 - 2004
Pigs	18,886	15.4	26,144	34.5
Cattle	4,064	13.0	4,908	30.2
Chicken	135,760	16.9	218,153	30.5
Buffalos	2,956	10.3	2,870	-0.8
Goats	525	16.8	1,002	47.2
Sheep	4.5	17.8	21.2	116.5

Vietnam National Statistics Department (2000, 2004)

### **Situation of small ruminant production in Vietnam from 1990 to 2004**

According to the data of National Statistics Department of Vietnam the population of small ruminants was around 1,450 sheep and 353,200 goats in 1990. In 2000 there were 4,500 sheep and 550,000 goats (72.5% the North and 27.5% in the South). By 2004 the population had increased to 1,002,000 goats (61.8 % in the North and 38.2% in the South) and 21,200 sheep (3.3% in the North and 96.7% in the South) (Table 1). Most of the goats are found in the hilly and mountainous areas (Table 2).

*Table 2. Land area and distribution of small ruminants in different areas of Vietnam in 2004*

Location	Land area Sq. km	Goat population		Sheep population	
		1000 head	%	1000 head	%
North of Vietnam	166.6	618,663	61.8	0.7	3.5
Midland and Northern Mountainous	102.9	392,910	39.2	0.2	-
Central of Northland	51.2	161,186	16.1	0.4	-
Red River Delta	12.5	64,567	6.5	0.1	-
Centre of Vietnam	78.2	89,150	8.9	18.3	90.6
Central coastal	45.8	22,630	2.3	17.1	84.7
High land	32.4	66,520	6.6	1.2	5.9
South of Vietnam	86.3	293,417	29.3	1.2	5.9
East of Southland	23.2	176,307	17.5		
Mekong river Delta	63.1	117,110	11.8	1.2	5.9
Total	331.1	1001.230	100	20.2	100

Source: Vietnam National Statistics Department, 2004

Goat products have higher prices than products from other animals (Table 3 and 4). 1 kg liveweight of goat for meat is 35.000 VND and for breeding 80.000 VND (compared to the cost of 1 kg beef or pig, 18.000 VND or 14.000 VND) 1 litre of goat milk costs 9.000 to 10.000 VND, while 1 litre of cow milk is 3.500 to 4.000 VND. The high price of the products gives a higher income for the raisers and promotes small ruminant production in Vietnam. (Diagram 1.)

Table 3. Animal products and percentags change from 2003 to 2004 in Vietnam

Target	Production 2003 (Mt)	Production 2004 (Mt)	Change (%)
Beef	107,540	119,78	7.08
Milk	126,000	151,314	19.84
Buffaloes	53,061	57,450	6,01
Pork	1,795,440	2,012,020	11.46
Poultry	372,721	316,400	-15.00
Egg (1000 eggs)	4,852,269	3,930,026	-18.75
Goat and sheep meat	15,600	21,200	20.10
Total	2.328,764	2.528,65	10.2

Vietnam Agriculture Department-MARD, 2004

**Goat** **Population**  
**Price** **1000head**  
**VND/kg liveweight**

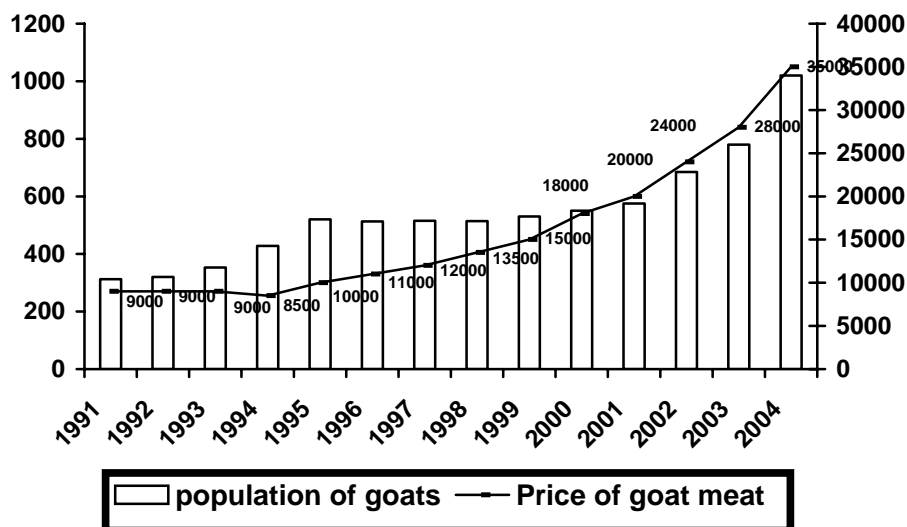


Diagram 1. Goat population and the price of goat meat

### Programs and projects on small ruminant production in Vietnam from 1990 – 2005

There were no programs or projects on small ruminant production in Vietnam until 1990. In 1991 the Goat Research Centre was added to the existing Rabbit Research Centre at Bavi and became the Goat and Rabbit Research Centre (GRRC) which is now the responsibility of the National Institute of Animal Husbandry (NIAH) of the Ministry of Agriculture and Rural Development (MARD). In 1994 500 goats were imported from India as a present from the Indian Government to the people of Vietnam.

In the period 1996-1998 there was a FAO/TCP/VIE 6613 project entitled “Well-being for poor farmers by developing goat milk production by using local feeds resources”. This was a very successful project and earned the FAO Edouard Soumar Award in 2001. From 1993 to 2005 the SAREC-SIDA and MEKARN project supported research on the use of local feed resources to develop sustainable integrated livestock farming systems for goats in Northern Vietnam. From 2000-2004 ILRI-IFAD/TAG supported a project entitled “Developing and Testing of an Integrated Approach to the Control of Gastro-Intestinal Parasites in Small Ruminants in Southeast Asia”

which resulted in the development of technologies for strategic application to control intestinal parasites in goat production systems. Over the period 2000-2005 The National Goat Breeding Program has been carrying out cross-breeding programs with local and introduced goats, and during this time, and with funding from the Vietnamese government, imported 120 Boer, Saanen and Alpine goats from the USA to use in the program. In 2002 -2005 the Vietnamese government supported The National Goat Studying Program. In 2005, a sub-centre of the GRRC at Bavi was set up in Ninh Thuan province (Central Coast area of Vietnam). In 2005-2008 the Vietnamese government will be supporting a new initiative, The National Sheep Study Program, in which information will be collected on indigenous sheep and used to develop sheep raising in appropriate areas of Vietnam. Between 2000 and 2005 the Vietnamese Government and some local government authorities developed policies for the development of small ruminant industries in Vietnam.

Table 4. Comparison price of goat and other products (VND/kg live weight of meat and/ kg milk)

	1990	2000	% Change/year 1990-2000	2004	% Change/year 2000-2004
Goat	9.000	18.000	20.0	35.000	48.6
Sheep	12.000	24.000	20.0	37.000	38.5
Cattle	8.000	12.000	6.6	18.000	37.5
Pigs	8.000	10.000	1.25	14.000	35.0
Local Chicken	18.500	19.000	1.03	30.000	39.5
Rice	3.100	3.000	-0.3	4.000	28.7
Goat milk	-	7.000	-	9.500	34.0
Cow milk	2.500	3.000	1.2	3.500	2.9

Programs have been conducted on how to best conserve the genetic information of local goat breeds (Bachthao, Co), selection of available local breeds, and importing some new highly productive breeds from India and the USA for crossing with local goats to improve meat and milk productivity. In addition, studies have been made as how to best use locally available feed resources, management methods, product processing, disease control and prevention, and on socio-economic issues, and how to best incorporate this information to develop sustainable integrated livestock farming systems for Vietnam.

## Results of studies on small ruminant production

### Breeding

**Local breed-Co goat:** This breed is very small in size, with an adult body weight of 30-35kg, and is usually brown and black in colour. Co goat is a meat type and is widely distributed in the country, accounting for 55-60% of the total goat population. The average daily milk yield, quite modest, is 0.35 kg. Age at first mating is around 7-8 months and the litter size is usually 1.2 kids.

- **Bachthao goat:** is a dual-purpose breed (meat and milk) that was developed in Vietnam a long time ago. They have long ears and short hair. The colour is usually black or black with spots and with white/brown stripes on the face. Both sexes generally have horns. The average height at the wither is 65 to 70cm. Bachthao bucks have been used to crossbreed with the Co to improve performance, and some results are shown in Table 5.

The Phan Rang Sheep is a group of sheep belonging to the short-thin tail type and existing in Phan Rang, Ninh Thuan province.. Sheep were raised only in the Phan Rang region (Central Vietnam) long time ago, with a population of 1,500-3.000 heads, but their origin is not known. In 1998 sheep were brought to the North to study how they would adapt to the environment. The population was in 2000 4,500 head and in 2004 21,200 head. The sheep are used for meat production only. The first oestrus is at an age of 7-8 months, estrus cycle is 18-21days, pregnancy period 5 months, birth weight 1.8-2.4 kg, adult female weight 32 to 37 kg and adult male 45-52 kg. (Nguyen Thi Mai et al., 2004)

*Table 5. The performance of Bachthao and Co goats and F1 (Bachthao x Co)*

Parameters	Bachthao	Co	F1 (Bachthao x Co)
<b>Body weight (kg) (Female - Male)</b>			
At birth	2.49-2.84	1.76-1.92	2.08-2.21
At 6 months	18.3-22.6	9.2-10.25	15.0-18.0
At 12 months	29.2-40.0	16.1-19.1	23.2-25.5
Adult (3 years)	45.3 - 73,2	30,2- 34,6	38,4- 45,3
<b>Milk production</b>			
Average milk yield (litres/day)	1.51	0.32	0.87
Lactation length (days)	154	95	115
<b>Reproductive performance</b>			
First kidding age of does (days)	356	335	340
Kidding interval (days)	217	257	213
Litter size (kids/litter)	2.09	1.45	1.65
Mortalities to 6 months (%)	13.4	36.4	18.5
Feed conversion efficiency (kg DM/kg gain) from 3 months to 9 months	4.49	5.34	4.34

Dinh Van Binh et al. (1997)

#### *Imported goat breeds*

*Imported from India:* In 1994 500 Barbari, Jumnapari and Beetal goats were imported from India to Vietnam as a present from the Indian Government. After 10 years they had adapted well to Vietnamese ecological condition. The breed is spread throughout Vietnam and the bucks are used to cross with goats of local breeds. Results from the research are shown in Table 5, 6 and 7. The body weight of the crossbreeds is higher than that of local breed; the highest is the F1 Beetal x Co cross, and the best milk yield is the F1 Jumnapari x Co cross. These crosses have been applied widely in the whole country.

*Table 6. Pperformance of Indian goats in Vietnam (1994-1998)*

Parameters	Barbari	Jumnapari	Beetal
<b>Body weight (kg) (Female - Male)</b>			
At birth	2.1-2.3	2.9-3.5	3.4-3.9
At 6 months	13.5-15.8	17.4-20.9	17.6-19.5
At 12 months	19.3-24.3	25.8-35.6	24.2-34.2
Adult	33.5-44.6	44.9-59.5	48.9-63.6
<b>Milk production</b>			
Average milk yield (litre/day)	1.3	2.1	1.9
Lactation length (days)	155	179	186
<b>Reproductive performance</b>			
First kidding age of does (days)	350	401	435
Kidding interval (days)	281	316	312
Litter size (kids/litter)	1.55	1.39	1.36
Mortalities to 6 months (%)	11.6	13.1	12.5
Feed conversion efficiency (kg DM/kg gain) from 3 months to 9 months	6.07	6.89	6.60

Dinh Van Binh et al. (1998)

Heritability of the milk yield of Bachthao and Indian goats was defined and used in a selection index to estimate breeding values to select nuclear herds for these goat breeds (Table 8).

*Table 7. Performance of F1 crosses between Indian bucks and local Co does*

Parameters	F1 (Barbari x Co)	F1 (Beetal x Co)	F1 (Jumnapari x Co)
<b>Body weight (kg) (Female - Male)</b>			
At birth	2.3-2.5	2.6-2.7	2.5-2.6
At 6 months	10.9-12.0	14.0-16.2	14.5-15.4
At 12 months	16.0-17.3	24.5-28.6	22.3-25.6
<b>Milk production</b>			
Average milk yield (litre/day)	0.83	0.85	0.83
Lactation length (days)	131	136	142
<b>Reproductive performance</b>			
First kidding age of does (days)	233	257	256
Kidding interval (days)	253	267	265
Litter size (kids/litter)	1.58	1.54	1.55
Feed conversion efficiency (kg DM/kg gain) from 3month to 9 month	7.3	7.0	7.5

Dinh Van Binh et al. (1998)

*Table 8. Heritability of milk yield (l/lactation) for some goat breeds in Vietnam*

Goat breed	Bachthao	Barbari	Jumnapari
Trait	Milk yield of 1 <sup>st</sup> – 4 <sup>th</sup> lactation	Milk yield of 1 <sup>st</sup> – 4 <sup>th</sup> lactation	Milk yield of 1 <sup>st</sup> – 4 <sup>th</sup> lactation
h <sup>2</sup> <sub>s</sub>	0.158	0.34	0.282
h <sup>2</sup> <sub>D</sub>	0.441		0.450
h <sup>2</sup> <sub>s+D</sub>	0.299		0.366

Dinh Van Binh et al. (2004).

*Imported from USA:* The Boer is a meat breed and Saanen and Alpine are milk breeds, and 120 head (5 males and 35 females of each breed) were imported from USA in 2001. The breeds have adapted well to Vietnamese conditions. The Boer goat has a large body size, high daily gain and high carcass percentage. Weight at 3 months of age is 20-24 kg, and at 12 months of age 48-50 kg. Saanen and Alpine goats can give 2.4-3 kg milk/day with a lactation length of 260-280 day (Table 9). After 3 years, total number of heads was 525. Over 200 bucks were used to improve the productivity of Bachthao, Barbari, Jumnapari, Beetal and F1 local crossbred goat (Tables 9 and 10).

*Table 9. Performance of Boer, Saanen and Alpine goats (2001,2002)*

	Boer	Saanen	Alpine
<i>1. Body weight female-male</i>			
Birth weight	2.8 - 3.1	2.99-3.28	2.58-3.12
6 months	25.8 - 28.1	17.5 - 24.4	15.2 - 22.9
12 months	41.9 - 48.6	30.8 - 35.5	26.4 - 32.5
Adult	85.5-126.6	50.5.-67.3	45.0-64.5
<i>2. Milk production</i>			
Average milk yield (litre/day)	-	2.84	2.42
Lactation length (days)	-	264.6	265.5
<i>3. Reproduction</i>			
First kidding age of does (days)	2.84	415.5	457.3
Kidding interval (days)	264.6	362	336
Litter size (kids/litter)	1.8	1.65	1.57

Dinh Van Binh, Nguyen thi Gang and Do Thi Thanh Van (2004)

*Table 10. Performance of F1 of Boer, Saanen and Alpine crosses with local goats.*

	Boer x Bachthao	Saanen x Bachthao	Alpine x Bachthao
<i>1. Body weight female-male</i>			
Birth weight	2.95-3.55	2.52-3.35	2.5-3.25
6 months	22.6-27.5	16.3-20.2	16.1-19.6
12 months	35.4-43.1	28.5-33.7	26.5-32.5
<i>2. Milk production</i>			
Average milk yield (litre/d)	-	1.7-2.3	1.5-2.0
Lactation length (d)	-	185.2	170.6
<i>3. Reproduction</i>			
Age at first kidding (d)	540	446	435
Kidding interval (d)	295	337	325
Litter size (kids/litter)	1.75	1.65	1.61

Dinh Van Binh, Nguyen and Kim Lin (2004)

## Feeds and feeding

Many experiments on planning, processing, storing and using forages, foliages from multipurpose trees and by-products for small ruminants have been carried out. The results are as follows.

*Biomass productivity of some forages and multipurpose trees as feed resources for small ruminants*  
Several kinds of forage and multi-purpose trees, with high biomass and high crude protein have been selected and applied on farm and have proved to be good feed resources for small ruminants, especially in the dry season.

*Table 11. Biomass yield (tonnes/ha/year) of some promising forage species in the Bavi region of North Vietnam*

Species	Biomass	Dry matter	Crude protein
Flemingia macrophylla	60.7	13.4	2.24
Trichanthera gigantea	62.7	8.1	1.33
Leucaena hybrid KX2	54.8	13.7	2.84
Leucaena leucocephala K636	39.7	9.9	2.1
Leucaena pallida K748	45.2	11.6	2.5
Mulberry (Morus alba)	23.0	3.9	0.67
Bananas (pure stand)	90.7	13.4	-
Trichanthera gigantea in association with banana	82.4	10.6	-
Panicum Maximum cv likoni	75.5	12.8	1.66
Brachiaria ruziziensis	76.9	13.8	1.38
Elephant grass	88.6	15.0	1.75

Nguyen Thi Mui et al. (2001)

### *Determinations of the nutritive value of different kinds of feeds for small ruminants*

The nutritive value of feeds has been studied using modern methods such as *in vitro*, *in sacco*, and biological tests. The information obtained has been a good base for estimating the nutritive value of different feeds and used in the feeding system.

### *Processing and use of locally available feed resources*

Technologies have been tested and the results applied in many farms, and can be summarised as follows:

- Molasses Urea Blocks as a feed supplement were studied and have been utilised efficiently for goats.
- The mixture of 25% dried cassava foliage + 25% dried Flemingia foliage + 11% cassava root meal + 11% rice bran + 28% molasses can replace 80% amount of green Paragrass in the diet for growing goats in the dry season giving better results in intake and body weight gain.
- Whole sugar cane can replace Guinea grass as a basal forage for growing goats without affecting performance. Animals fed with whole sugar cane chopped into slices (1-3cm) attained higher feed intake and better growth rate than those fed with whole sugar cane chopped into 20 cm lengths and split into 4 parts.
- In the diets for late pregnant ewes, the diets with forage species such as Jackfruit, Cassava or Flemingia foliage gave the best ewe and lamb performance, and the best combination was Jackfruit and Cassava foliage.
- A supplement feed made of sugar cane juice (75%) and boiled soya bean (25% of air dry bean) was utilised efficiently by kids between the age of 6 and 20 weeks. The supplement increased daily live weight gain by 42-55%.
- Both Jackfruit and Flemingia foliage can be used as protein-rich resources to replace the crude protein in the concentrate at 50% and 26% respectively.

## Management

There are three main methods for management of small ruminants in Vietnam; intensive, extensive and semi-intensive management systems. In the intensive system, animals are kept separately in pens (Devendra and McLeroy, 1982) and nutrients are supplied entirely from outside. 10 days after kidding the kids are separated from their mother, and the does are milked twice daily and their yields recorded. The kids are allowed to suckle after milking, and milk consumed by the kids is estimated by weighing kids before and after suckling. The kids are weaned at three months of age. In the semi-intensive system, small ruminants are grazed, and supplied feed at the goat house at night. This system is easily applied to existing small ruminant production systems in Vietnam. In the extensive system, animals are grazing without supplementation. This system is common in Vietnam. Investigation results in some provinces in North Vietnam of goat management systems are shown in Table 12.

*Table 12. Number of households and changes in type of goat management between 2000 and 2004*

	Hatay		Hoabinh		Thainguyen		Ninhbinh		Total	
	2000	2004	2000	2004	2000	2004	2000	2004	2000	2004
Extensive	32	9	35	11	22	13	25	6	114(79%)	29(27%)
Semi-intensive	8	40	0	24	7	16	0	18	25(17%)	98(68%)
Intensive	5	6	0	0	0	0	0	0	5(4%)	6(5%)

Dinh Van Binh, Nguyen and Duy Ly, (ILRI project report, 2001 and 2004)

## Health management and incidence of diseases

The major diseases reported among small ruminants in Vietnam are internal parasites, Ecthyrnatosis, Diarrhea and Pneumonia. The important and dangerous infectious diseases with high mortality (Pasteurellosis, Enterotoxaemia) are effectively controlled by vaccination. Other infectious diseases, which spread rapidly, (Ecthyrnatosis, Keratoconjunctivitis) are treated effectively with local medicines. After appropriate treatment 80-90% of all infected animals are cured.

The goats are mainly kept in extensive and semi-intensive systems in which the goats are housed in low cost housing or in reasonably sized yards enclosed by wooden fences at night. The

cages are often made of bamboo. The waste from goats is rarely gathered in the areas next to the goat houses. Incidence of under-nutrition, inbreeding and poor hygiene is still widespread in small ruminant systems at the village level and there is little attempt by farmers to control internal parasites. This lack of management leads to low productivity and poor economic returns for the farmers.

*Table 13. Mortality rates (%) of goats in some provinces of North Vietnam in 1998*

Mortality rate (%)	Hatay	Thainguyen	Hoabinh	Ninhbinh	GRRC
Birth to 12 months of age	32-35	44-45	40-42	39-44	9.2
% distribution					
Birth to 3 months	64	62	65	61	69
3-6 months	26	25	25	27	22
6-12 months	10	13	11	12	9

Dinh Van Binh et al. (ILRI project report, 1998)

From 2001-2004, with support from the ILRI- IFAD-TAG 443 project, methods for the control of gastro-intestinal parasites of goats were studied and measures applied in some areas, with good effect (Table 14 and 15).

*Table 14. Improvement in goat productivity after application of research findings from the ILRI/IFAD/TAG-443 project*

Parameters	Old system (80 goat farms)	New system (80 goat farms)	% Change
Goat herd size (head/farm)	13	22	
Mortality (%)	40	17	-23
Weight gain (g/day)	37.5	46.3	23.5
GI parasite infection rate (%)	82	63	-19
Income (Million VND/person/year)	2.55	3.99	56

Dinh Van Binh, Nguyen Duy Ly and Somkiat (ILRI project report 2004)

*Table 15. Incidence of major diseases of small ruminants and results of treatment in Hatay Vietnam*

Diseases	Rate of infection (%)		% Mortality after treatment
	Winter (dry season)	Summer (rainy season)	
Pneumonia	14.5	9.6	7.5
Diarrhea	15.3	25.8	11.8
Internal Parasites	64.7	71.4	8.6
Ecthymatosis	17.2	7.9	5.1
Pasteurellosis	7.4	6.5	4.5
Enterotoxaemia	6.0	7.3	5.3
Keratoconjunctivitis	3.5	2.8	0.0

Dinh Van Binh and Nguyen Duy Ly (2003)

## Processing and marketing of products

Products from small ruminants (meat and milk) are not usually consumed by Vietnamese people, mainly because they are not commonly available in the market. However, in recent years, as Vietnam's economy has been liberalised, living standards of people are improving, and this is a favourable environment in which to promote small ruminant products. The market for selling products from small ruminants has become easier. In addition, since 1998 the FAO/TCP-VIE 6613 project through the Goat and Rabbit Research Centre has developed new technologies for the collection of goat milk from farmers and for small processing units for the pasteurisation of milk

and the making of goat cheese and yoghurt. Markets for these products are being readily found in the cities, providing farmers with greater income and new opportunities to further develop their goat production systems. There is a high demand for goat meat in many different areas of Vietnam and the rate of increase in the number of goats is not sufficient to meet this demand. As a consequence, the price of goat meat is increasing rapidly and the limit to meeting this demand is the lack of suitable goats for breeding. This need could be partly met by expanding the current centre for goat production in North Vietnam to new areas in central and south Vietnam. This expansion is currently one of the new initiatives actively being pursued by the GRRC for the future.

### **Advantages and disadvantage of small ruminant production in Vietnam**

#### *Advantages of small ruminant production*

- The rapid expansion of small ruminant production is meeting the policies of the Vietnamese Government by creating employment and improving the well-being of poor farmers.
- A low investment in breeds, sheds and feeds resulting in high returns to capital invested through short generation cycles and high productive rates.
- Efficient use of available pastures in the hilly and mountainous areas which occupy three quarters of the country.
- Simple feeds for goats from agricultural by-products are efficiently converted into animal products. It should also be noted that the efficiency of converting feed into goat meat and milk is higher than that found for larger ruminants such as beef and dairy cattle.
- Lamb meat, goat meat and milk is highly appreciated and more expensive than other products, which in turn, can provide higher incomes for producers and better nutrition for humans, particularly malnourished children (comprising 30% of children) and the elderly.
- Past government and International Organisation funding support has had a major and favourable impact on goat production and provided many good practical demonstrations of improved management practices for Vietnamese farmers

#### *Major constraints of small ruminant production systems*

The following constraints to small ruminant production in Vietnam are recognised:

- While some appropriate technologies for improving goat production have been developed in the last few years, these technologies are region specific and need to be modified and expanded to meet the needs of all regions of Vietnam, particularly Central and South Vietnam.
- Traditional goat production systems in Vietnam are mainly extensive systems using natural plants as feeds and medicines. So, the incidence of under-nutrition, inbreeding and poor hygiene is still widespread in these village systems, as is infection with internal parasites. Therefore goats in these systems have low production, low reproductive and growth rates and high mortality
- Lack of experience and knowledge, availability of credit, technical information and lack of productive breeds severely affect the rate and extent to which goat productivity can be improved, especially in hilly and mountainous areas.

### **Planning for research and development of small ruminants in Vietnam from 2005-2010**

#### *Goat breeding objectives*

- Selection of local breeds of Bachthao (Ninh Thuan) and Co goats (Ninh Binh, Hazar), and Phanrang sheep (Ninh Thuan) within nuclear herds at both GRRC and in their regions of origin (traditional raising) to improve productivity under improved management (GRRC) and to maintain genetic diversity in the indigenous breeds.

- Use of Bachthao and Jumnapari (Indian goats breeds) bucks for crossing with Co goats to create F1 and F2 (50 or 75%) to improve the production of both meat and milk. This method could be applied widely across the whole country.
- Selection within nuclear herds at GRRC of Boer, Saanen and Alpine goats to maintain breed purity and to select for meat and milk production under improved management conditions in Vietnam. Ultimately these goats will be used in future cross-breeding schemes with Bachthao and their crossbreds in village systems
- Use of selected Boer bucks for crossing with Bachthao (local breed), Bachthao x Co or Jumnapari x Co does to create Boer x Bachthao, Boer x Bachthao x Co and Boer x Bachthao x Jumnapari crossbreds for meat production
- Use of selected Saanen and/or Alpine bucks for crossing with Bachthao and Bachthao x Co or Jumnapari x Co does to create Saanen/Alpine x Bachthao, Saanen/Alpine x Bachthao x Co and Saanen/Alpine x Bachthao x Jumnapari crosses for milk production
- Both crossbred lines will be simultaneously evaluated at GRRC and in villages as F1 (first cross) and subsequently as F2 populations (F1 x F1) over a 5 year period. After this time, quantitative measures of productivity should be available to make recommendations on the most suitable crosses for meat and milk production. During the breeding program, bucks will be used rotationally to avoid any inbreeding..

#### *Feeds and feeding systems*

Continue to identify useful local feed resources in each integrated livestock farming system. There are three feeding systems which are commonly used:

- Extensive Grazing System - feeds mostly from native grasses and tree leaves and mostly found in mountainous and often dry areas. New feed sources need to be developed for these areas with improved biomass yields and forage quality..
- Semi-intensive feeding systems - goats are mostly grazing during the day, and housed at night when additional feed can be offered. Opportunities are available to plant multi-purpose (fodder) trees such as Flemingia and Leucaena, and improved grasses to increase biomass yields
- Intensive feeding systems - Goats in this system are mostly confined in pens and offered cut-and-carry feeds. Opportunities also exist in this system or improving forage supply and quality with multi-purpose trees, supplementary feeding with cereal by-products and improved grasses and legumes.

In all systems there are opportunities for processing, storing and making better use of local feed resources to provide sufficient year-round nutrition for small ruminants.

#### Other objectives

- Study of the socio-economic impact of improved goat production in Northern Vietnam with a view to develop appropriate development strategies and technologies for improving goat production in the Central and Southern areas of Vietnam
- Control of diseases and intestinal parasites by developing strategies (e.g. vaccination, suitable housing etc.) to manage the major diseases of goats throughout Vietnam.
- Studies of the processing, use and marketing of small ruminant products to make goat raising more profitable for the farmer.
- Set up a small sub-Centre at Ninh Thuan province (in the Central Coastal Region) to develop appropriate regional strategies and provide crossbred goats for the further development of the goat industries in the Central and Southern regions of Vietnam.
- Training and dissemination of information on new technologies for improving goat productivity and model farm demonstrations of sustainable and integrated small ruminant farming systems.

- Develop further collaborations with international and regional agencies and organisations in Southeast Asia as a means to increase the rate of application of relevant technologies to goats in Vietnamese farming systems.

## Conclusions and recommendations

In the past 10 years, research and development studies of small ruminant production in Vietnam have resulted in some achievements. Goat production is playing an increasingly important role in the improvement of the income of poor farmers and is contributing significantly to poverty and hunger alleviation in Vietnam

Specific studies of the crossing of local goats with introduced breeds, of nutrition and feed resource availability and quality, animal health and product processing has led to training programs in improved goat production for livestock advisers and farmers and to village demonstrations of how goats can be integrated into sustainable livestock farming systems for Vietnam. Vietnam has a recognised potential to develop and further expand small ruminant (goat and sheep) production systems. This potential is being progressively realised through collaborative research programs run by staff of GRRC, livestock advisors and Vietnamese farmers and generously supported by the Vietnamese government, non-government organisations and international aid agencies. The continued support of all these groups is essential for stimulating further development of goat and sheep production in all areas of Vietnam.

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