
Buffalo breeding programme in Thailand

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Buffaloes (*Bubalus bubalis*) in Thailand are classified as swamp type. Practically all swamp buffaloes are raised on rural smallholder farms where mixed crop-animal farming systems are prevalent and buffalo form an integral part of the farming system. The swamp buffalo on smallholder farms primarily provides a source of farm power for tillage and transportation and a source of manure for fertiliser, while sale of old buffalo for cash becomes a family long-term saving.

The most common places where buffaloes play a prominent role are in rice production areas. Draught power from the swamp buffaloes is commonly used in lowland rainfed rice production systems, while irrigated rice cultivation usually employs farm machinery. Upland rice and other crops also utilise swamp buffalo power wherever available.

The swamp buffalo production on smallholder farms in village conditions is characterised as complementary to crop production, making use of non-marketable farm products and marginal lands, utilising available family labour, requiring minimal cash input and simple and traditional technology. It is generally non-market oriented production, and is subject to a relatively low degree of risk. In general, attention is not given to obtaining a high rate of output of meat from the swamp buffaloes because other products and services are more important in the small farm systems. In general, the small farm buffalo husbandry can be described as follows.

Village farmers usually utilise marginal land areas available in the village such as paddy fields, scrub forests on upland areas, highway shoulders, rice bunds and communal grazing lands for buffalo and cattle grazing. In general, buffaloes depend mainly on rice straw and stubble; other crop residues, such as corn stover and cassava or kenaf leaves may also provide substantial sources of roughages, especially during the dry season. Generally, concentrate or mineral supplements are not given to animals. There are generally no cash inputs in buffalo raising and most tending is done by family labour, i.e. children, women and the old.

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Due to high slaughter rates including illegal slaughter, scarcity of farm labour and grazing areas, increasing use of small two-wheel tractor and lower market price of buffalo (as compared to beef cattle), the number of buffaloes in Thailand had declined at the rate of 3.8 percent annually during 1984 to 1994 (Chantalakhana, 1996). In 1985 there were 5.25 million buffaloes but in 1998 only about two million buffaloes remained in Thailand. Besides, the average mature body weight and size of buffalo have also decreased in the past decades due to castration of larger buffalo bulls for farm work at about one and a half years of age, while larger females were often sold for slaughter.

National buffalo selective breeding programme

Breeding goal and purpose

Due to the lack of a national buffalo breeding improvement programme and apparent decline in genetic quality of the Thai swamp buffalo, the Department of Livestock Development (DLD) of the Ministry of Agriculture and Agricultural Cooperatives (MOAC) and Kasetsart University (KU) developed a joint project to improve buffalo production through breeding selection since 1975 with the support at the beginning of the programme from the Rockefeller Foundation (Thailand). Also in 1971 the Director-General of the DLD and his technical adviser from West Germany were very keenly interested in improving buffalo productivity and were encouraged by the FAO Livestock Specialist in Bangkok at that time. The breeding programme, however, was only partly implemented until 1980 when performance testing was carried out.

The breeding goal was to select superior buffaloes for draught and meat since most farmers in rainfed areas keep buffalo mainly for draught power and sale for meat purposes. The following traits were selected to be used as the main selection criteria.

- 1) At weaning:
 - 240 day adjusted weaning weight (AWW);
 - pre-weaning average daily gain (pre ADG);
 - general appearance.

- 2) At the end of testing:
 - average daily gain (test ADG);
 - two-year adjusted weight (2 AW);
 - height;
 - general appearance.

The breeding goal and selection criteria, as well as other technical details, were decided and revised, when necessary, by a joint national committee which was appointed and chaired by the DLD. The details of breeding and testing schemes established by the committee and presently being carried out, are shown in figure 1.

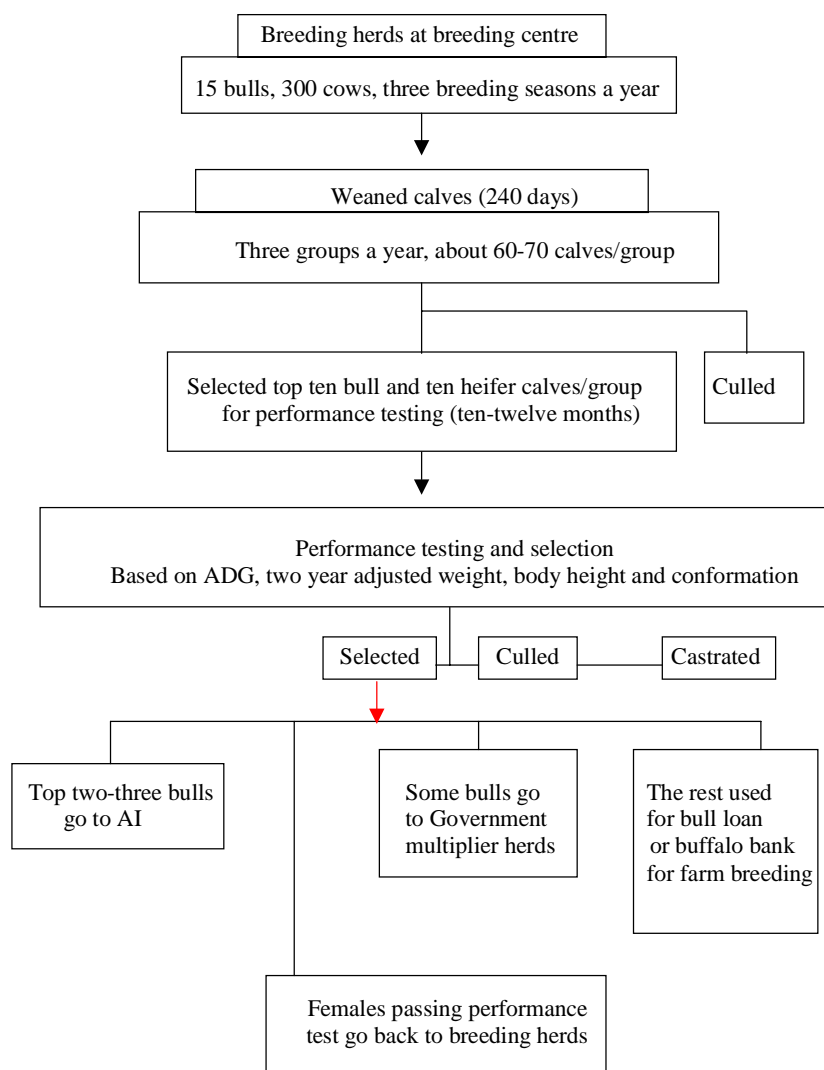


Figure 1. Breeding and testing scheme.

- 1) The DLD provides and maintains all breeding animals at Surin Buffalo Breeding Center (Northeast Thailand), and carries out performance testing at Lamphyaklang Livestock Station (260 km from Surin).
- 2) Kasetsart University provides technical inputs and research support, including the carrying out of data collection and analysis at an initial stage of the project.

Collaborative agencies and their contributions

At a later stage other institutions such as Chulalongkorn University, Khon Kaen University, etc., joined this project which has been expanded in its objectives to cover a wider range of disciplines such as health, reproduction and nutrition.

Breeding and testing schemes

As shown in figure 1, superior breeding buffaloes, 15 bulls and 300 cows, are kept at Surin Buffalo Breeding Center (DLD). These breeding stocks were originally selected both from Government stations and private farms. Single-sire herds are managed in three breeding seasons, using one bull to about 15 to 20 cows. During each breeding season about five single-sire herds are used. Feeding is based on grazing in pasture during the day (one acre per animal). Each herd is confined to a loose pen at night. During the rainy season grass soilage is used to feed animals in the barns. Hay, silage, rice straw plus one to two kilograms concentrate supplement per head are used during the dry season (usually January to May) when pasture becomes limited.

About 60-70 weaned (240 days) calves are produced during each breeding season. Only ten top bull calves and ten heifers are selected for performance testing based on their AWW and ADG. The selected animals are then transported to Lamphyaklang Livestock Station (DLD) for performance testing for ten to twelve months. The duration of performance testing is relatively long in order to allow the animals to express their genotypic performances on a low level of feeding. The animals are fed mainly on grass pasture plus a minimal concentrate supplement. The feeding regime used for performance testing of buffaloes is being kept at a level close to that practiced by small farmers in order to minimise possible influence of genotype by environmental interaction when the tested bulls are used on smallholder farms in villages.

After one year of performance testing buffalo bulls are selected by the joint national committee based on the selection criteria mentioned earlier. The animals passing the test will be used for breeding purposes as follows:

- top two or three bulls used for AI;
- next superior bulls may be used in multiplier herds in Government stations if needed;
- the rest could be used in a bull loan programme, buffalo bank programme or sold to farmers for breeding purposes.

So far, at least one thousand male buffaloes have been tested and about half of them passed the performance testing. Approximately 40-50 bulls were used for AI by the DLD. The rest were used in other DLD buffalo breeding stations as well as in villages through Government extension programmes.

The selected heifers will be used as a replacement in breeding herds at Surin. Culled animals will be sold for meat.

The use of superior buffalo genetic stocks in a nation-wide breeding programme was shown by Intaramongkol (1998) in figure 2. Below is a brief summary of a national buffalo breeding plan.

- 1) Since only one breed of swamp buffalo exists in Thailand, the selected tested bulls are used in the nation-wide breeding programmes. It should be noted that there are a number of swamp buffalo of white coat colour (about three to five percent) but the black or grey animals are preferred by farmers, therefore only black or grey swamp buffaloes are used in the national breeding selection programme. As shown in figure 2, the top bulls are used for the AI service to smallholder farms (base population), while some top bulls are used in multiplier herds such as

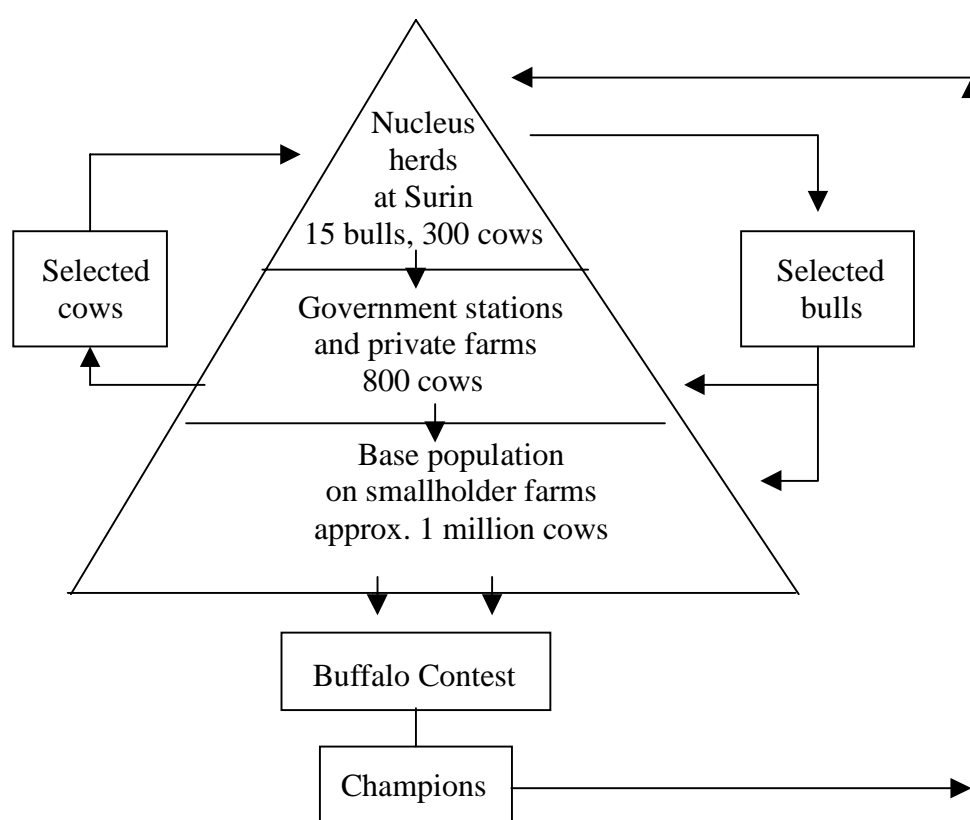


Figure 2. National buffalo breeding programme.

that in Government stations and a few private breeding farms. Some remaining tested bulls may be sold for breeding purposes to farmer groups such as bull service or bull loan group in rural villages.

- 2) Some number of selected females with good breeding records may be used as a replacement in the nucleus herds when needed. Some surplus cows from the nucleus herds may also be sold to farmers.

- 3) In order to encourage farmers to pay more attention to buffalo breeding, every year since 1994 the DLD organizes the National Buffalo Fair presided by the Minister of Agriculture and Agricultural Cooperatives and attended by farmers from all over the country. Buffalo contest is one of the main features of the Fair, in which champion bulls and prize-winning females are identified and may be sold to the DLD for breeding in the nucleus herds or multiplier herds.

Some results of buffalo breeding

Intaramongkol (1998) summarised some growth performance traits of buffaloes as resulted from breeding selection at Surin Buffalo Breeding Center as shown in table 1. It can be seen that the 240 day WW had increased from 121 kg in 1983 to 167 kg in 1995 with a genetic trend of 0.135 kg per year, the pre-weaning ADG increased from 459 g per day during 1983-1989 to 555 g in 1995 with a genetic trend of 2.073 g. For the animals subjected to performance testing the 2-yr AW (adjusted weight) increased from 268 kg in 1983 to 317 kg in 1995, while post-weaning ADG increased from 408 g in 1983-1989 to 410 g in 1994, but fall to 295 g in 1995 due to certain health and management factors. The height at wither of buffaloes at the end of the test increased from 118 cm for the first group to 124 cm for the 30th group (Konanta and Intaramongkol, 1994).

Topanurak (1992) used buffalo data at Surin Buffalo Breeding Center to estimate heritabilities of growth performance traits and reported as follows (see Table 2). It was found that the heritability estimates ranged from low to high. The growth traits of animals tested were highly influenced by genetic factors, while the pre-weaning traits were low to medium in genetic influence.

Table 1. Growth performance of Thai swamp buffaloes at Surin Buffalo Breeding Center.

Traits	<1983	1983-1989	1990	1991	1992	1993	1994	1995	P ¹	Trend G ²
Birth weight, (kg)	28.4 (144)	30 (1 373)	30 (209)	28.4 (111)	29.9 (200)	30.3 (187)	31.9 (193)	30.6 (77)	0.026	- 0.084 kg/yr
240-d WW, (kg)	121 (96)	141 (990)	150 (194)	146 (170)	138 (190)	156.3 (200)	152 (146)	167 (159)	1.105	- 0.135 kg/yr
ADG/g	-	459 (990)	504 (194)	481 (170)	456 (190)	522.6 (200)	484 (146)	555 (159)	5.314	- 2.073 g
2-y AW, (kg)	268 (21)	355 (339)	354 (59)	377 (38)	394 (40)	368.4 (56)	356 (39)	317 (36)	-	-
Post ADG, g	-	408 (380)	392 (60)	441 (40)	469 (40)	416.5 (56)	410 (39)	295.8 (36)	-	-

Note: Figures in parentheses are the number of observations.

¹P = Phenotypic, trend.

²G = Genotypic trend.

Table 2. Heritability estimates of some growth traits of swamp buffalo.

Traits	Heritability	S.E.	Number of observations
BW	0.23	0.10	1 429
240-d	0.09	0.05	1 126
2y AW	0.60	0.25	437
Pre ADG	0.06	0.05	1 126
Post ADG	0.75	0.10	437

In order to increase the effectiveness and the efficiency of the present buffalo breeding programme, the following suggestions were offered for appropriate action.

1. Increase the size of the nucleus herds in order to increase selection intensity. The number of cows, if possible, should increase to 600 instead of only 300, and the number of bulls can increase proportionately. The performance testing of females can be terminated in order to allow more bulls to be tested.
2. Promotion for wider use of AI in buffalo ought to be supported. At present less than one percent of buffalo cows are artificially inseminated due to lack of interest among farmers.
3. More efficient systems of animal recording, data collection and analysis need further attention. Responsible personnel require more training in animal breeding and statistical analysis in order to carry out the jobs more efficiently.
4. Concerning performance testing, it is recommended that some number of bull calves sampled from smallholder farms ought to be tested along with the selected bull calves from the nucleus herds in order to check occasionally whether genetic superiority has been really attained through present breeding methods.

As mentioned earlier, the present breeding goal has been based on selection of buffalo for draught-and-meat purpose, in which height as well as body weights are selected using low-input feeding regimes. However, due to increase in beef demand and use of farm mechanisation as well as some other changes in socio-economic conditions of some small farm sectors, it is foreseen that part of buffalo production in Thailand will be oriented more towards commercial beef production. Therefore, the goal of buffalo selection should be based primarily on meat or meat-and-draught purpose. This may mean that the primary aim of selection should focus more on beef production traits and the feeding regimes should be formulated

Possible improvement of current breeding programme

Future changes in the breeding goal

towards fattening operations but based on the use of locally available crop by-products or cheap carbohydrate sources such as cassava chips or cassava hay.

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