RAISING RABBITS IN COASTAL BRITISH COLUMBIA

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Abstract - This paper illustrates a profitable and successful method of raising rabbits in a facility suitable for the Pacific coastal areas of Oregon, Washington, and British Columbia (in the USA and Canada), or also in other temperate climates. The advantages of this facility are its low capital cost, its low operating cost by maximizing use of natural air flows, natural lighting, natural (shade) cooling in the summer and natural solar heating in the winter, and the ease of restoring the sanitation of the caging. There is a barrier between each cage to prevent contamination cage to cage, and each cage is easily removed for cleaning. Does are rebred by a formula, $r = 4(int(s-2.6)^2/4)+1$, which keeps a certain consistent but flexible and not excessive breeding pressure on the doe. A steady (standard deviation of the means divided by the arithmetic means of fryer shipments every two weeks was 0.269) output of fryer rabbits is maintained throughout the year including the winter months, with a winter total-barn feed conversion of 4.32:1.

INTRODUCTION

Over the past 17 years the author has been developing a good breeding herd of New Zealand White rabbits. The rabbits have been in several types of housing - first in an open building, then in a closed building with ventilation, heating, cooling and dehumidification, then finally in the last several years, the rabbits have been returned to an open facility designed with reference to Harris et al. (1983). This development has been successful, and the success of open air systems has recently been validated by GOBY and ROCHON (1994). Salespersons for enclosed intensive rabbit management systems consistently attempt to show that an open air non-environmentally controlled, non-intensive system cannot give steady production through the winter. In order to quantify the success of this facility, data on fryer production and feed consumption was collected during the winter months of January, February and March, and including April, 1995 in order to establish a winter total-barn feed conversion ratio.

MATERIALS AND METHODS

The rabbit building is 3.6 x 25 metres. The construction method is driven treated poles, with truss roof framing. The roof covering is translucent woven poly plastic (10-year life). The building is situated under broad-leafed maple trees so that it is in shade from about April 1st to the third week in October. This gives natural lighting all year and solar heating in the winter. The natural photoperiod is extended by fluorescent lighting which works by photocells to extend the lighting up to the limit of the timer at 16 hours photoperiod. This system turns off the artificial lighting during the day when there is sufficient natural lighting. Natural daylength at this latitude is about 8 hours in winter, and 16 hours in summer. The normal seasonal temperature variation is between -9 and 29 degrees Celsius, with temperatures outside of this range less than 2% of the hours in a year.
Normally, cross flow ventilation by the wind is adequate, but in times of no wind there is an exhaust fan at one gable end, to remove heat build-up under the plastic roofing. The plastic could be slit open along the ridge to let out heat, but that would give the high winds something to catch. In dry summer weather, there are southerly on-shore breezes during the day and northerly off-shore breezes during the night. The rabbit building is set across this flow to give maximum summer air movement. Plastic windbreak with 40% open area is in position along the south perimeter from October to April to reduce the wind flow, which is frequently greater than 60 km/hr. This plastic windbreak is the "Tensar Windbreak" from Netlon Ltd., Blackburn, UK. During dry winter weather with periods of arctic outflow winds, both sides and ends of the building are sheeted with poly film leaving a strip open the length of the building on both sides, top and bottom, 11 cm wide which is never closed.
The cages have been made at low cost by cutting up bank caging from defunct factory farms to make singly hung cages. Cage size is standardized at 61x76x38cm (width x depth x height). Between each cage is a 2-3cm space for a semi-rigid translucent plastic divider which hangs between the cages. Feeders are bin type feeders with no projection into the cage area. Metal box nests are used, with perforated board floor, stuffed with wheat

straw for bedding. Water is supplied by 4-litre water bottles on metal stands at the front of each cage, with a brass nipple inserted through a rubber grommet.

Cages are hung at about 120 cm above natural soil base. Being on a hillside, natural soil drainage has been adequate. The manure is shovelled out in a dry, loose pellet condition as required for fertilization of the sheep pastures. Very little copper is added to the feed so that the manure is still usable on the sheep pastures, and the sheep do not seem to be bothered by the rotavirus as calves are (BURATTO and COLIN, 1992).

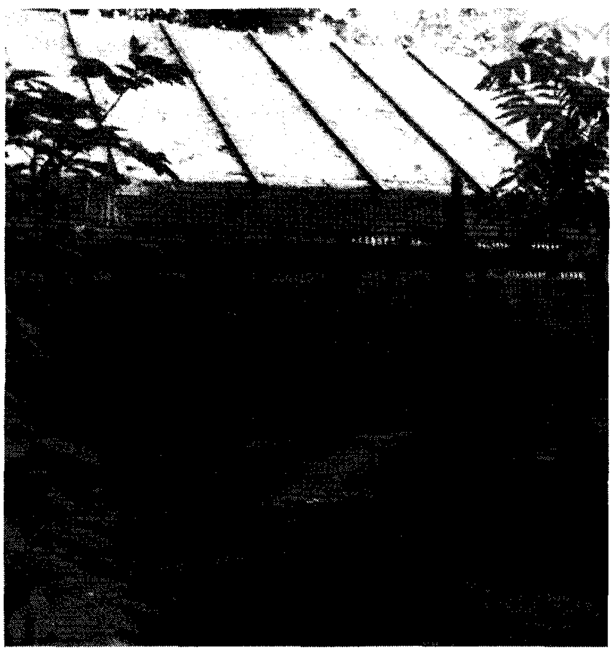
Security is maintained by a four-strand electric fence outside of the building to keep out the wily coyote and other stray canines.

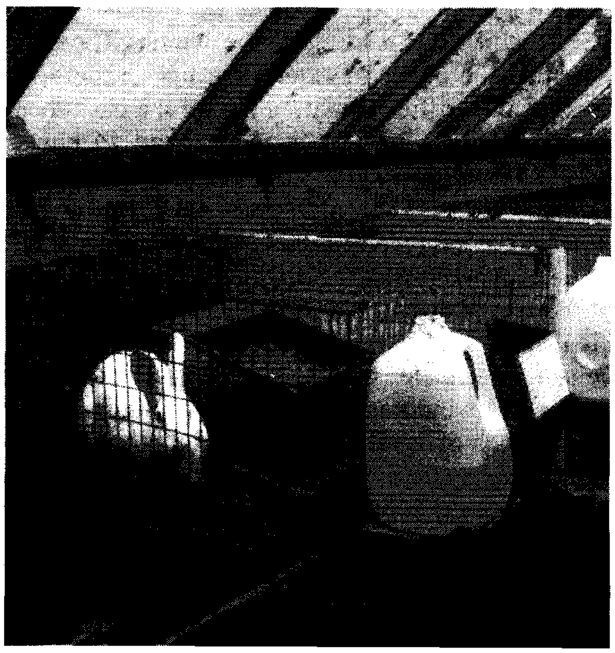
Animals with serious health problems are moved to a separate cull building. The main health problems are snufflers and bubblers (*Pasteurella multocida* and *Bordetella bronchiseptica*) and enteritis (rotavirus followed by E. COLI), with minor problems being coccidiosis and sore feet (pododermatitis). We are north of the mixomatosis area and therefore not affected. The rotavirus can affect the pups in the nestbox before they have eaten any feed. Pododermatitis is the result of a simple bacterial infection which is treated easily with pine tar, and is not a function of exposure to cage wire as proposed by DRESCHER (1992) since only a few animals are affected.

Does are bred at about 150 days, or 4.5 kgms. The doe is with the buck for two services, usually just a few minutes. Young does are bred to new bucks, old does to old bucks, cull does to separate bucks. On the eleventh day after mating, the does are checked for pregnancy by detecting the slight swelling in the lower abdomen. On the 20th day after mating the does are checked for pregnancy by feeling for the distension of the caecum on the right side of the rabbit, the caecum being displaced by the litter. On the 29th day, any older fryers are removed and the nest box is provided. At parturition, the litter is checked to see that there is at least 3 cm of straw on bottom and all sides of litter, so that the litter does not touch the sides or bottom of the box. All feed is free choice except for bucks and out-of-cycle does, which are restricted to 150gm per day.

Does are rebred by a formula, $r = 4(\text{int}(s-2.6)^2/4)+1$, where r = rebreed day after kindling and s = litter size, but the maximum value for r is 41, and the +1 is omitted during winter breeding for values of r over 9. See table below. This formula is originally based on the 4 day interval found in the data tables in DIAZ et al. (1987), modified by extension and litter size. The litter size is re-evaluated at nest inspections up until the removal of the nest box. Thus the date the doe is to be rebred is adjusted to suit the number of remaining young. This keeps a certain consistent but flexible and not excessive breeding pressure on the doe, adjusted by the number of the offspring currently in the litter. This avoids the arbitrariness and lack of consideration for the reproductive load on a doe of a set breed-back schedule.

The nest box is removed at 21 days and young counted and recorded. Neither the does nor their young are ever weaned. It is difficult to wean (stop milk production) of a doe except by prolonged dehydration and fasting, so the young are left with the doe until the next nest box is provided, at which time the young are removed, if they have not already been sent to market. Keeping the young with the doe as long as possible reduces the space requirement of fryer caging, allowing more cages to be used for does thereby improving profitability as described by PATTON and AYERS (1992).





For the past several years replacement does have been selected from parent does which have successfully raised a litter of 10 (to three weeks old) on their first litter. This trait seems to have a good rate of selectability. This practice significantly reduces losses caused by primiparous does. As long as the does continue to have litters of 9 or more, according to the above formula they are on a 40-41 day re-breed, and produce 45-58 fryers per year. Some does have produced these large litters (9-14) up to age 5 years.
The feed being used was a custom formula of manufactured pellets, composed of alfalfa meal, wheat millrun, canola meal, soy bean meal, molasses, corn gluten meal, tallow, barley, tricalcium phosphate, salt, pellet binder, vitamin premix, choline, DL-methionine, DL-lysine and yucca extract. A typical analysis by a National Forage Testing Association certified lab gives, on an as-fed basis: moisture 12.5%, total nitrogen 3.18%, ADIN 0.16%, ether or hexane extract 4.5%, Ca 1.05%, Ph 0.85%, ADF 18.4%, NDF 30.2%, K 1.22%, Mg 0.31%, ash 7%. Calculated amino acids are lysine 0.99%, sulphur-amino acids 0.61% and choline calculated at 2738 mg/kg. Higher levels of zinc and selenium are included in the feed to help with buck's fertility in the summer (EL MASRY et al., 1994) and vitamin E supplementation to improve the overall fertility of both males and females. Due to the fact that our national government does not recognize legitimate rabbit research done in any other country, we are not allowed to add live bacteria, such as lactic acid producing bacteria, to our feeds, or to our own water supplies for the rabbits, or coccidiostats. The feed cost was cdn$0.29 per kilogram in bulk, delivered price.
The fryer market was in Oregon State (USA), at US$1.7632 per kgm, less shipping cost of US$0.1543 per kgm and changed to Canadian currency (cdn$*0.725=US$) giving a net price of cdn$2.22 per kgm during the data recording period.

RESULTS AND DISCUSSION

Important to the profitability of a facility is its capital cost and annual per-doe depreciation cost. This rabbit building is classified as a special purpose building, greenhouse style, so qualifies for a 15 year depreciation schedule. The building cost was about cdn$1875 divided by 15 years and 60 does (total 75 cages), gives a building cost of about cdn$2 per year per doe. Including the cage, feeder, waterer and nest box costs, lighting and water supply, this amounts to about cdn$80 per doe undepreciated capital expense or about 280 French Francs, lower than the value of 800 Francs quoted in GOBY and ROCHON (1994).
Essential to maintaining a steady output of fryer rabbits is stock selection and seasonal adjustments to the rate of breeding. For the past eleven years does have been selected which have good production in the winter months. This past year, 1995, the highest per month output of fryers was again in February (middle of northern winter). This is done as mentioned by selecting does that produce a large, live first litter, by breeding about 65% of the does each month in the winter months including re-breeds and by reducing the breeding rate to 35-40% of the does per month in March, April, May, and June. Breeding rate is increased for the winter after July 10th, for the October fryer output. Although mid-winter was peak production, the fryer output over the whole year is very consistent, consistency being defined as the standard deviation of the means divided by the arithmetic means of fryer shipments every two weeks, being less than 0.333. The actual consistency rate for this facility for the year was 0.269. A low value for this rate indicates a steady income to the breeder as well as a reliable supply to the slaughter house.
Average total-barn feed conversion is a measurement of success in the rabbit operation. The total-barn feed conversion, which is the total mass of feed consumed by all animals divided by the mass of all fryers sold, for the months of January, February, March, and April 1995 was 4.324:1. This value could have been lower, but the winter of 1995 was the low point in the 7-year rabbit cycle. The total barn feed conversion is kept low by feeding a high protein and high energy feed (SANCHEZ et al., (1985), SANKHYAN et al., (1990) and CASTELLO and GURRI 1992), by breeding about the same number of does each day to keep down the number of bucks required and by minimizing losses of young rabbits. Using this winter average feed conversion, an average fryer of 2.272 kgm was responsible for a feed consumption of 9.824 kgm. Using the above fryer value and feed price results in a fryer value of cdn$5.04 less a feed cost of cdn$2.85 for an income before fixed and operating expenses of cdn$2.19 per fryer. The ratio of feed cost to total income is 2.85/5.14 = 55.4%, but at other times of the year it has been recorded as high as 65%, as in MAERTENS (1992), page 889. The importance of the total barn feed conversion factor can be illustrated, by using the above values, to show that in this situation, above 7.65:1 feed conversion, there is no profit above feed cost. In a study of rabbit producers in British Columbia in 1981, the range of values of feed conversion was from 6:1 to 16:1 (FERENCE, 1981).
Several procedures are done to minimize the loss of young rabbits. The single water bottles protect against disease spread since there is no possibility for water to flow from one cage to the next. In plumbing terms, these

water bottles are providing a "vacuum break" at each cage, a feature that is available in certain commercially produced water systems, but at much higher expense.

The main asset in a rabbitry is the health of the animals. One thing of primary importance in maintaining health is being able to restore the building to the original condition of sanitation it had before any rabbits were put into the building. Some method of disease prophylaxis must be undertaken to renew the sanitation of the rabbitry (SCHLOLAUT, 1992, pages 559-600) radically different than is practised or possible in most rabbitries. A permanent bank of caging seems to produce a rabbitry with a short useful life, while easily removed cages allow long term operation. All our cages are single cages hung on clips at the rear and hooks at the front, so that each cage can easily be lifted out, cleaned and baked in a sterilizer oven as necessary. This system is effective against one of our local problems, rotavirus, and also for all other diseases. Also, on a hot day over 30C., at least one buck cage can be easily removed to be placed directly on a spot of clean soil in the shade, so that he can keep his essential parts cool by ground contact. The cage is moved to a clean spot each day and rehung after the hot weather is past.

The plastic divider between cages prevents disease from spreading cage to cage. It is immediately evident, on pulling out the plastic divider, how well this system prevents material (hair, urine, feces, etc.) from entering the adjacent cage. It has been possible (this is not recommended) to have a litter in which all the young die of enteritis beside a litter being saved for replacements with no transmission of the disease. With the separately hung cages and the plastic divider, it is easy to hang a collection tray under any cage for digestibility testing. In the separately hung cages, with the plastic divider providing a visual and scent-marking barrier to the adjacent cage, the does and bucks are calmer and don't have to be defensive. Does are very territorial and are calmer and produce better when they have reduced contact with other does. The "social contact" suggested to be necessary as an external stimulus by DRESCHER (1992), is, in reality, the desire by each doe to eradicate the neighbouring doe. In our facility, rabbits have shallow tin cans 8 cm x 4 cm for toys, and each doe has her own "room-with-a-view" onto a quiet green-belt area beside the building. The building is situated right back into the "bush" as we call it here.

Tabulation of rebreed formula results

litter size (s)	1	2	3	4	5	6	7	8	9	9+
Rebreed day (r)	1	1	1	1	5	9	17	29	41	41
Rebreed, winter	1	1	1	1	5	9	16	28	40	40

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