SESSION II

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RABBIT PRODUCTION IN TROPICAL COUNTRIES

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Abstract

Rabbits are making an increasing contribution to meat production in many developing countries in the tropics. These animals are capable of supplying meat in reasonable quantities when kept under small-scale low input systems.

This paper draws attention to some of the advantages of the rabbit as a meat producer in tropical countries, and also to the problems which must inevitably arise.

Although successful rabbit production is being achieved in many cases, notably in Ghana, there is considerable room for improvement without resorting to the use of expensive equipment and materials. Work needs to be carried out on many aspects of rabbit meat production in the tropics. The most important consideration is nutrition and feeding in relation to the efficient utilisation of locally available materials. The Tropical Products Institute in collaboration with Reading University has initiated a research programme on this subject. Some data arising from this project is discussed. Much of the information presented was collected during overseas visits by the author.

Introduction

There is evidence that rabbits are beginning to make a useful contribution to the meat supply in many tropical developing countries. The greatest potential for the use of meat rabbits is in those countries which experience national meat shortages. However, even in countries where official statistics indicate adequate consumption levels, the uneven distribution of supply often means that the poorer people are not able to purchase sufficient meat for their needs. Under such conditions the value of the meat rabbit is becoming increasingly recognised in both rural and urban communities.

The advantages of the rabbit as a meat producer in the tropical developing countries have been pointed out by Owen, Morgan and Barlow (1976) and by Owen (1976)

In developing countries, the vast majority of meat rabbits are produced under non-intensive small-scale, or backyard systems. It is in such systems that the rabbit can make its most valuable contribution towards supplying meat for the poorer urban and rural peoples. Where a strong market demand for rabbit meat and reliable feed supplies of good quality can be developed, commercial production at intensive or semi-intensive levels may well be feasible in the tropics. Indeed the intensive commercial rabbit industries of countries such as France and the UK have been developed from small scale backyard industries.

Breeds

In the developed countries the New Zealand White has displaced most other breeds for meat production. Indeed in countries such as the UK it is used to the exclusion of almost all other breeds for this purpose, although on the

Continent of Europe, breeds such as the Fauve de Bourgogne, Californian, Beveren, Termonde White and Belgian Silver are also used (Belgian Government Research Station for small Stock Breeds, 1972).

The reason for the popularity of the New Zealand White is that it has been found, by many breeders, to be superior in terms of breeding and meat production when kept under intensive commercial systems. The New Zealand Whites now used in the UK, have been specially bred for such systems.

The situation in developing countries is different in that a wide variety of breeds are used for meat production. Different breeds appear to be favoured in different countries. In most cases the use of a particular breed or breeds is purely fortuitous, depending on the breeds that were originally available. These breeds were originally introduced to different countries for a variety of reasons (Owen et al 1976). Nowhere has a particular breed of rabbit been selected and developed specifically for tropical backyard conditions. Notwithstanding this, many of the well-known breeds (ie the New Zealand White) appear to have adapted very well to the varied tropical conditions.

There is obviously a need for work to determine the most suitable breeds for use under various tropical conditions. It should be pointed out that the requirements of local farmers are often subjective and not always related to the performance of the animal. For instance size and colour can play an important part in the popularity of a given breed or strain. A larger breed may be preferred even though it may have poorer growth and reproductive performances than other smaller breeds also available. In Nepal white is unpopular because of its association with pet rabbits. Even within one area, such as Pokhara, there can be a diversity of demand with regard to colour in rabbits (Craven, 1977). There is a need in these cases to have available a choice of coloured breeds.

Nutrition and feeding.

The general nutritional needs of the rabbit, as far as they are at present understood, have been reviewed in the literature by Portsmouth (1977) and Davidson (1977).

Nutritional data relating to the rabbit as an intensively reared commercial or laboratory animal are now accumulating at a reasonable rate. However, with regard to low input systems, particularly in relation to the tropics, few data are available. The most important nutritional aspect as far as small-scale, low input systems are concerned is the rabbit's ability to utilise fibrous material in the form of herbage (fresh or dried) and agricultural waste products.

It has been pointed out that the rabbit, which is a non-ruminant herbivore, is much less able to digest dietary fibre than ruminants such as goats, sheep and cattle (Davidson, 1977). Cattle are reported to be twice as efficient as rabbits in this respect (Slade & Hintz, 1969). However the faster rate of passage through the alimentary system of non-ruminant herbivores allows a higher rate of feed intake. An adequate amount of nutrients can be obtained from relatively poor quality high fibre diets in this way, whereas rumen fill with fibrous material can prevent this happening in the ruminant (Bayley, 1978). It has in fact been stated that hind gut digestion, which takes place in the rabbit, is a superior adaptation for dealing with high fibre herbage, provided that intake is not restricted by the actual quantity of herbage available (Jarvis 1976) Another advantage enjoyed by the non-ruminant herbivore is the ability to utilize soluble carbohydrates in plant material more efficiently by absorbing them as sugars rather than convertin- them to volatile fatty acids. The rabbit also offsets some of the relative inefficiency of hindgut digestion by practising coprophagy. With regard to dietary fibre requirements a level of 12-14% fibre in the diet is recommended for breeding rabbits, but non-breeding stock will take

up to 25% fibre (MAFF, 1976). Walsingham and Large (1977) have shown that weaned New Zealand Whites can produce growth rates of 38-39g a day up to 2kg liveweight on diets consisting solely of dried herbage. However, this was achieved with high quality lucerne and ryegrass hay and such good quality herbage is not always available to the tropical backyard farmer. Liveweights of 1.23kg at 16 weeks were obtained using 100% alfalfa (Trifolium alexandrium) diets on Flemish Giant x Baladi Red rabbits in Egypt (Aboul-Seoud, Abdel-Salam, Radwan, Raafat and Abou-Raya, 1970). The mean growth rates of the weaned rabbits up to 1.23kg liveweight was 9.6g a day.

In practice diets for rabbits can be based largely on herbage, although the feeding value of different herbage species can be expected to vary considerably. In the Philippines it was found that para grass (Bachiria nutica) when fed to breeding does produced better performances than either napier grass (Pennisetum purpureum) or guinea grass (Panicum maximum). In most countries, however, it is difficult to maintain rabbits solely on fresh grasses and other herbage throughout the year. Apart from the fact that the quality of the herbage varies with the growing season, in some countries such as central Nepal (Craven, 1977) and Egypt (Aboul-Seoud, et al 1970) there is a serious shortage in the dry season. In other countries such as Togo, there is a persistent state of drought.

The conservation of herbage such as lucerne hay in Egypt or dried groundnut leaves in West Africa (Odonkor, 1977) is one answer, although this is not always possible. In Nepal, for example, the relative humidity is usually too high for 'hay making' after the monsoon growing season. Where hay making is possible and where legumes (ie alfalfa, clover, lespedeza, cowpea, vetch, kudzu and groundnut) are available, it is better to make legume hay since this contains about twice as much protein as grass hay and is palatable to rabbits (Weisbroth, Flatt and Kraus, 1977).

The use of forage legumes cut at an early stage, and leguminous species such as leucaena is worthy of investigation. In Pokhara, Nepal, Gynura cusimba is unique in that it grows fairly abundantly in the dry season in very poor soil. Its leaves have a crude protein content of 27% (DM) and it is eaten readily by rabbits, although refused by other livestock, including goats, presumably due to poor palatability. Similar examples of locally available herbage of particular use in rabbit feeding must exist in many tropical countries. Again in Pokhara six week weaning weights in rabbits of 800-1,000g were obtained on a diet consisting solely of radish tops (Craven, 1977).

In many areas it has been possible to produce home mixed concentrate rations using such materials as rice bran, spent brewers' grains, ground maize, groundnut cake and coconut cake. The availability of agricultural by-products offers particular scope for the production of such foods on a local basis. A major problem in the feeding of such concentrate rations is that they are nearly always fed in meal form which often gives rise to considerable wastage. Modifications in the design of feeding troughs can help to minimise this (Odonkor, 1977). Preliminary work on a collaborative project between the Tropical Products Institute (TPI) and Reading University had indicated that problems can be encountered when feeding meals to rabbits. From table 1 it can be seen that on a low energy diet, weaned New Zealand White Rabbits were hardly able to produce any weight gain at all from diets fed in meal and mash form (Owen, Bryant, Machin, Owen and Butcher, unpublished data). Diets of identical composition fed in pelleted form produced growth rates of 21g/day. In the case of high energy diets (table 2) the rabbits appeared to be able to cope with the meal and mash presentation much better, but again growth performance was poorer than in those fed on pelleted diets. Although wastage was particularly high in the case of the meal presentation, the feed containers were continually topped up so that the rabbits had excess feed available throughout the trial. This has important implications since pelleting facilities are not widely available in the developing countries, especially to backyard farmers.

The question of palatability is also important, as demonstrated by Cheeke (1974) in his studies on Dutch Rabbits. Rabbits, however, will consume diets high in

alfalfa that rats, pigs and chickens reject. It has been suggested that this is largely related to taste responses, as rabbits have a higher tolerance for bitter compounds than the other animals (Cheeke, 1977). Evidence to support this is given by Hermus (1975) who fed quinine sulphate to rabbits at levels of up to 1%. Cheeke (1977) provided further evidence in a study which involved feeding rabbits on high and low saponin-alfalfa meals.

It is evident that there are very many problems associated with the feeding of rabbits under small-scale conditions in the tropics, but there are also many possibilities, and in several countries the problems are being tackled with some success. However, nutrition and feeding is an area which needs considerable attention.

Housing and Equipment

It is not always possible for the backyard farmer in a developing country to obtain wire, especially galvanised wire of the correct gauge and mesh size which is commonly used in commercial systems. Thus, most backyard units consist of outdoor cages which have only crude shelters, if any. In such systems wire is in any case unsuitable for anything but the fronts and floors of housing due to the lack of protection from weather and disturbance. Wood is the most commonly used material in places where wire is either too expensive or unavailable, and has been used satisfactorily in several African countries. It has been reported that concrete cages with wire floors are used in a large commercial Angora rabbit project in Kulu, Himachal Pradesh, India (Acharya, 1977). Most often a combination of wood, or woody material and wire is used. Wire is especially useful for the fronts (for observation purposes) and floors. A wire floor is easier to keep clean and assists in maintaining a high level of hygiene.

In many African countries chicken wire (usually supported with wooden struts) is used with apparent success. However, experience in UK rabbitries has shown that the use of any wire but the recommended type has resulted in problems with sore hocks. The commonly used type is galvanised wire of 1.6-2.0mm thickness and 19mm x 19mm or 25mm and 13mm mesh size. This is clearly an area which needs further investigation.

With regard to feeding and drinking equipment, a great variety of innovations employing locally available materials such as old bottles and tins etc can be found throughout the tropics. The problem of wastage when meals are fed has been tackled with varying degrees of success.

Although there do not appear to be any great problems in the use of locally design and made equipment, many farmers would benefit considerably from exchanges of information, both within and between countries. This has not yet happened on any significant scale.

Disease

Rabbits are prone to a variety of diseases and these have been reviewed by Ostler (1961) and more recently by Cowie Whiting (1977).

Rabbits kept under backyard conditions are usually relatively healthy, providing attention is paid to cleanliness, the sensible construction and siting of housing and good feeding practice, without undue recourse to expensive drugs and treatment.

Tropical conditions can of course give rise to special problems. If adequate protection is not provided against cold winds and rain, which occur seasonally in many parts of the tropics, pneumonia can cause serious losses.

External parasites such as the chicken flea, Echidophaga gallinacea, and particularly Sarcoptes scabei which causes sarcoptic mange, can be troublesome. The ears of the rabbit are particularly vulnerable to parasites, which can in some cases be controlled by such simple methods as the application of palm oil.

One of the major disease problems in many countries, including those in tropical latitutdes, is Coccidiosis, which particularly affects young weaned rabbits and those kept on solid floors. Damp climatic conditions also enhance susceptability to Coccidiosis. In Nepal it was found that the problem occurred mainly in the very damp weather following the monsoon in September. The treatment of all stock during this month, and young stock for one week at weaning, with embazin, proved to be effective and inexpensive. A management regime of frequent cleaning and changing of housing, with the avoidance of undue stress, also helps considerably.

There is much scope for work in this field, and experience in some countries has shown that inexpensive and effective disease control is possible under tropical backyard conditions.

Climate

The most obvious feature of tropical climates which might be expected to affect rabbit production, is the occurrence of high ambient temperatures. The fur-bearing rabbit is largely reliant on respiratory evaporation for the regulation of its body temperature, which implies only a limited capacity for adaptation to higher ambient temperatures (Lee Robinson and Hines, 1944; Kamar, Shafie and Abdel Malek, 1975). Also the physiological effects of such temperatures on rabbits are closely related to relative humidity, being more acute when the humidity is high. Temperature effects appear to be more serious if the high ambient temperature is constant. At ambient temperatures above 30°C rabbits suffer increasing discomfort and stress (Lee et al, 1944, Shafie, Malek, El Issawi and Kamer, 1970). No data is available to date which indicates differences in the

ability to withstand heat stress by different breeds. However, Srivastava and Mukherjee (1976) reported that there was no difference between Albino and non-Albino rabbits in this respect.

Sittman, Rollins, Sittman and Casady (1964) indicated that maximum daily temperatures above 26-27°C severely depressed reproductive activity in penned New Zealand White rabbits. Work by Tacher (1970) in a dry Sudanese climate and also by Kirkpatrick and Somade in Nigeria, provided similar findings. Laboratory studies on the domestic rabbit have produced some insight into the problems associated with reproduction at high ambient temperatures. The studies of Olouta, Bogart and McKenzie (1951), Hiroe and Tomitsuka (1965), Chou, Yi-Ch'uan and Chen-Ch'ao (1974) and Rathore (1970) have demonstrated that ferility in male rabbits can be impaired, although not irreversibly, at these temperatures. Also in female rabbits embryo mortality was found to increase (Shah, Rich and Alliston, 1970, Alliston, Howarth and Olberg, 1955).

Published information based on field studies in tropical countries is virtually non-existent, although general observations by rabbit farmers appear to support the above findings. It is of course very difficult to disentangle the effects of adverse temperatures from those of other factors such as poor nutrition in non-controlled field conditions.

In Ghana observations have shown that young rabbits up to two weeks of age were particularly affected by high ambient temperatures (Odonkor, 1977). Field Studies by Cleland (1978) in St Vincent led to the conclusion that the occurrence of high ambient temperatures was a major factor in reducing the productivity of rabbits.

There are also nutritional implications (Kirkpatrick & Somade, 1974). For instance feed intake is reported to decrease with increasing temperature (Prudhon, 1976). This introduces the possibility of varying dietary formulations in hot and cool seasons. In certain circumstances water intake decreases also (Johnson and Ragsdale, 1957).

In certain countries such as Ghana, Nepal and Mauritius, it has been found that cold wet weather is a much more serious hazard to rabbits than high ambient temperatures, especially if the onset is sudden. This has already been referred to. Although the effects of high ambient temperatures should be always borne in mind by farmers in the tropics, it should be pointed out that in practice they can be minimised by properly designed housing which may be constructed from locally available material.

In temperate countries seasonal breeding behaviour of rabbits can be attributable to variations in day length. In the fairly constant day lengths of tropical latitudes, little seasonality of breeding, other than that associated with extremes of temperature and humidity, has been experienced.

Performance levels

Performance levels being currently achieved in UK intensive commercial rabbit units are (45-50) young reared per doe per year (approx 6 litters), with meat rabbits achieving a slaughter weight of 2kg in 2 to 2½ months. In general, rabbits kept under backyard conditions will not perform so well, particularly if they are not fed on balanced high energy and high protein diets. However, the main advantage of such systems is that meat can be produced cheaply with very low inputs other than labour.

Results being currently achieved in developing countries are illustrated in Table 3. With the exception of Oman & The West Indies, where the figures were obtained by correspondence (Bell, 1977, Cleland 1978), the data were collected by the author during visits to the countries concerned in late 1977. Again with the exception of Nepal, the West Indies and Oman, all of the data were recovered from controlled projects of various kinds rather than from local farmers, who generally did not keep any records.

From the author's experience greater attention needs to be paid to record-keeping in such projects. Accurate records, even very simple ones, are essential if any systematic progress is to be made and various production problems dealt with

effectively, particularly those concerned with breeding and feeding. The data quoted were not collected under scientifically controlled conditions, but do serve as a useful indication of the general production levels being achieved.

The production figure of about 20 young reared per doe per year (4 litters), was remarkably common throughout the countries visited. Slaughter weights of the order of 2kg were mostly obtained at 4 months of age or more.

There is clearly room for improvement, although the performance levels quoted for UK commercial rabbits would not be generally achieved without recourse to intensive high input systems. But even with low input backyard systems, considerab progress could be made by such means as the identification and development of breed and strains best suited to tropical backyard conditions, the raising of general management standards, and particularly, by the use of improved feed formulations based on locally available materials.

Discussion.

A number of problems have of course been encountered, the nature and severity of which vary according to the area and country concerned. These have resulted in some failures, chiefly amongst inexperienced farmers who had not received adequate instruction. However, there is evidence of considerable success in some areas. The success rate has been relatively high in countries where Government support has been strong. For example, The National Rabbit Project (NRP), which has played a vital part in the development of rabbit meat production in Ghana, arose as a direct result of Government support. The NRP, apart from providing breeding stock to villagers, has been very active in the dissemination of practical information. Such support has also been important in Mexico where a Government organisation dealing with small species, such as poultry and rabbits (Direccion General de Avicultura y Especies Menores) has set up a chain of about 40 extension centres throughout the country. At these centres farmers are provided with breeding animals, and given short courses in rabbit management which include instruction in

the preparation of meat. At the largest centre in Irapuato, they are also taught to process rabbits' skins and manufacture fur skin products.

Although the domestic rabbit is derived from the cool temperate European species Oryctolagus cuniculus, it has adapted well to hot tropical conditions provided it has been given sensibly constructed and sited housing. In fact periods of wet windy weather have appeared to cause far more problems than high ambient temperatures in the tropics. Although preferences have developed for different breeds in different countries, in many cases it is not at all clear if these preferences are based on sound production information or how representative the particular strain is of the breed in question. The situation with regard to breed choice is in many cases adventitious and work needs to be carried out in this area.

The area which needs the greatest attention, however, is concerned with the nutrition and feeding of rabbits and the efficient utilisation of locally available feeding materials. To this end a collaborative project has been set up between TPI and Reading University. The project is investigating the utilisation of low energy high fibre diets by rabbits kept at high ambient temperatures.

Finally, it is of the utmost importance that there is an exchange of ideas and information between various rabbit producers and projects both within and between countries. The provision of new information on such topics as nutrition and health by research, practical experience and field studies, is of little value unless it can be readily disseminated. National rabbit associations, and the recently formed World Rabbit Science Association could do much to achieve this. However, such associations cannot survive and function without support. It is up to Government organisations, farmers and all other interested bodies to provide such support.

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TABLE 1: THE EFFECT OF FEED PRESENTATION ON THE GROWTH PERFORMANCE OF NEW ZEALAND WHITE RABBITS KEPT AT 25°C AND FED ON DIETS CONTAINING 8MJ/kg METABOLISABLE ENERGY LEVELS (WITH STANDARD DEVIATIONS WHERE n = 4)

Form of Presentation	Pellets	Mash	Meal
Initial Liveweight (gm)	1478.00 ± 47.97	1328.50 ± 181.22	1373.00 ± 87.75
Final Liveweight (gm)	2049.75 ± 89.13	1420.5 ± 484.50	1374.75 ± 220.09
Growth Period (Days)	30.5 ± 0.58	37.75 ± 5.06	42.00 ± 00
Daily Weight Gain (gm)	20.73 ± 3.73	3.45* ± 12.06	3.24 ± 5.91**
Carcase Weight (gm)	1044.25 ± 60.30	-	-
Dressing Out % (Empty Gut)	58.20 ±	-	-

Two Rabbits of each sex per group. Rabbits slaughtered at approx 2 kg liveweight.

* On mash presentation one rabbit lost weight and died after 32 days.

** On meal presentation one rabbit lost weight. In both cases rabbits remained on treatment for 42 days and no slaughter data were recorded.

TABLE 2. THE EFFECT OF FEED PRESENTATION ON THE GROWTH PERFORMANCE OF NEW ZEALAND WHITE RABBITS KEPT AT 25°C AND FED ON DIETS CONTAINING 12 MJ/kg METABOLISABLE ENERGY LEVELS (WITH STANDARD DEVIATIONS WHERE n = 4).

FORM OF PRESENTATION	PELLETS	MASH	MEAL
Initial Liveweight (gm)	1468.00 ± 218.56	1427.25 ± 121.87	1393.25 ± 69.39
Final Liveweight (gm)	2072.00 ± 33.33	2111.25 ± 29.49	2192.75 ± 78.76
Growth Period (Days)	19.00 ± 7.57	25.25 ± 4.86	29.50 ± 1.00
Daily Weight Gain (gm)	33.10 ± 4.69	28.00 ± 1.60	26.51 ± 3.65
Carcase Weight (gm)	1111.75 ± 20.65	1171.75 ± 27.00	1220.75 ± 72.07
Dressing Out % (Empty Gut)	58.90 ± 1.89	61.00 ± 0.94	62.45 ± 2.03

Two rabbits of each sex per group. Rabbits slaughtered at approx 2kg liveweight.

TABLE 3 RABBIT PRODUCTION PERFORMANCE DATA FOR VARIOUS DEVELOPING COUNTRIES

Country	Place	No of Litters/Year	No of Live Young/Litter	Total Weaned Doe/Year	Slaughter or Market Weight (kg)	Age at Slaughter or Marketing (Months)
Ghana	Legon	4	5	20	1.6-1.8	4.5-5.5
	Tsito	4	6	24	1.3	?
Tanzania	Moshi	3	5	15	3	6
	Marangu	2-3	4	10	1.8-2	4
	Kilacha	4	6	24	1.2	2.5
	Mtwara	3-4	6-7	23	*	4-5
Nepal	Kathmandu	4	7	28	2	3
	Pokhara	4-5	5-6	22	*	*
Oman	Al Kabourah	5	4	20	*	4-9
Mexico	Chihuahua	3-4	6	21	1.2	2
W Indies	St Vincent	3	3	9	1.5	5.5-6

* In these cases no data were available. In many areas of developing countries livestock or carcases are not weighed before sale.