

7. ANIMAL PRODUCTION IN SINGAPORE— PRESENT STATUS AND TRENDS

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Introduction

Scarcity of land resources has limited animal production in Singapore to pigs and poultry, the two main livestock which are best suited for intensification. Further limitations are imposed by rapid industrial, urban and housing developments which are also accompanied by an increased demand for water resources.

Ruminant production is virtually non-existent in Singapore and the requirements for beef and mutton are totally dependent on imports mainly from Australia and New Zealand.

It has been estimated that there are 14,000 farmers keeping pigs and poultry either singularly or in mixed farms. The productions from these farms contribute to a large proportion of the total protein requirements of the 2.2 million population in Singapore. The annual production of 1,279,000 pigs, 28 million poultry and the 378 million hen eggs not only meet the total requirements of the country for these items, but also provides surplus for exports. The total estimated value of these items at \$238 million represents 78% of the total output of primary produce in Singapore.

Pig Farming

Pig farming is widely distributed in the Island Republic amongst the 13,000 farms which are of varying sizes ranging from those which keep a few animals each to intensive farms of up to 15,000 pigs. Most of the farms are family owned and are managed by family labour. There are only 37 farms (0.28%) which keep more than 1,000 pigs each whereas 33% of all pig farms keep less than 11 pigs each. The farm units are small with the majority ranging from 0.1 ha. to 4 ha. in size. On an average the distribution approximates 65 pigs per farm.

Since 1967, when importation of all pigs from the Malayan Peninsula was terminated the level of production has increased significantly; and during the period 1968 to 1972 the total pig population has increased by 68%. This rapid increase in pig population was brought about by increased local demand for pig meat and the Government's policy to develop and maintain a pig industry of its own. The improvements made in the fields of husbandry, breeding and disease control no doubt has enabled this to be achieved in the short period of time.

Pig farming has the help of a relatively well developed animal feed industry which produces nearly half-a-million tonnes of prepared animal feed annually of which a good percentage are exported to the neighbouring countries. Improved breeds of pigs were first introduced by the Government in the late 1950s in the form of the Berkshires. Subsequently other breeds like the Landrace, Large White (Yorkshire) and the Hampshires were introduced. Multiplication schemes and an artificial insemination service were established to disseminate the desirable traits of these exotic breeds which over a short period of time have completely replaced the South

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China pigs. The control of infectious diseases like Swine Fever (Hog Cholera) and improvements made in the veterinary health service of the country generated further confidence amongst the pig farmers resulting in a more distinct orientation towards the establishment of more intensive pig farms as seen in Table 1.

Table 1. Distribution of pig farms*

Size of farm	1970	1971	1972
1~ 10 pigs	6,600	5,390	4,313
11~ 100 pigs	6,326	5,810	6,300
101~1,000 pigs	1,579	1,683	2,285
More than 1,000 pigs	15	21	37
Total	14,520	12,904	12,935

* Farm licensing data

This orientation towards more intensive farms, however, has not kept up with the rapid pace of the other forms of industrial developments within Singapore.

The lack of a sizeable export market renders the industry very sensitive to fluctuation in both supply and demand. Although the supply and demand situation over the years increases in a fairly constant manner, market demand and supply within any one year fluctuates quite significantly because of the large number of the smaller farms which have the capacity to rapidly increase or reduce pig population in their attempts to anticipate either an increase in market demand or supply. This has not contributed towards a stable pig industry.

Development of Intensive Pig Production Units

An unstable market and insecurity of land tenure have been the principal factors which prevented the establishment of intensive pig production units—the farmers being generally hesitant to invest in large sized intensive production units because of the fear of production gluts and the uncertainty of having enough time to amortise his investment. Other factors were the lack of financial capacity to ride over periods of low pricing and the dependence on the middleman to market the produce. However, recent developments clearly show that intensification would be an essential feature for future development of the pig industry.

The pace of other developments has further resulted in an increased rate of resettlement of a larger number of pig farms. In the past these resettled farmers had been able to re-invest their compensations in establishing other small farms. The present situation, however, has changed and small farmers are being resettled in flats built by the Housing & Development Board and re-allocation of land for agricultural activities are limited to those who have the capacity to develop and contribute towards significant agricultural productivity. Furthermore, anti-pollution measures are sufficiently stringent to deter the smaller farmers from venturing into pig production. The suggested minimum number of pigs kept for new pig farms is 100 pigs—which is more than the number of pigs kept by 82% of the pig farmers.

The trend towards development of more intensive pig production units is evident in the larger farms which are taking advantage in trying to offset production loss caused by resettlement of other pig farms. They have developed the financial capacity and the management expertise to intensify. Generally their productivity and the quality of the pigs produced from these larger farms are higher and they are able to demand a premium for their produce thereby ensuing that they are least affected

when prices of pigs are low. They are also less affected by manipulations of pricing by the middleman. The numbers and the constancy at which they are capable of supplying secure them the most favourable contract price. The middle sized farms have also been awakened to their need to consider the idea of joining forces to better utilize their resources in some form of co-operatives.

In encouraging this trend of intensification the Government has specially allocated pig farming estates where sufficient period of land tenure would be ensured at a reasonable rental. This provision of a designated intensive pig farming area also has the aim of controlling the pig waste problem in a satisfactory manner. Carcase grading standards have also been introduced to encourage a more objective quality assessment of the pigs produced. The meat processing technology development unit established by the Government has shown that the local pigs meet the required standards in terms of carcase quality and are suitable for processing. This has aroused a great deal of interest within the industry to establish pig meat processing plants.

There has also been considerable interest from other countries in joint venture participation to establish highly intensive integrated production units. It has been estimated that utilizing conventional methods of husbandry the total requirements of pig meat of the Republic can be produced from 90 farms each about 3 ha. and keeping 1,000 sows or 180 farms each of 500 sow units. The units could be made much larger if industrialized methods of production were to be adopted and land requirements further reduced if multi-storied housing were to be adopted.

Pig Waste Control

Waste from pig farms has been identified as a major source of pollution particularly of the water catchment areas. To meet the increased demand for water resources it has become necessary to utilize some of the existing agricultural areas as catchment areas. In a recently developed catchment area covering some 46 sq. miles there was found to exist 2,673 mixed and 2,057 pig farms (APPAN 1973). In 43% of the units, pig waste was discharged without any form of treatment while 32% of the units discharged the waste into slurry pits, and 11.7% of the farms possessed cesspits.

Cesspits were previously installed as an interim control measure in the smaller farms pending their being phased out. These were constructed in areas which were more sensitive to the problem of pollution from run-off water. In one particular scheme over 2,000 cesspits were built and these were found to provide about 20-30% treatment provided the partially digested sludge was removed regularly. Regular removal, however, was a problem as often accessibility to the cesspits on the farms was difficult and it was not uncommon for the cesspits to be choked and the waste then overflowed into the streams. The problem is aggravated by the type of husbandry practised by the smaller farms which necessitate them to utilize large quantities of water to bathe the pigs and wash down the sties. The large amount of water used together with the high rainfall which flows into the cesspits increased the total volume of waste substantially and presents quite a problem in desludging.

Another crude method of containing pig waste on the farm is the construction of slurry pits into which the wastes from the sties are discharged directly through open drains. The waste in this method is made uncontrollable when rainfall increases the volume of waste which then overflows as surface run-off. Land irrigation or fertilization of the soil with the slurry is practised by the smaller pig farmers who are often also market gardeners growing vegetables and orchids. However, the amount of land available for cultivation does not justify such a method of waste

control and utilization.

An improved method of containing pig waste on the farm is the construction and housing of pigs of all age groups on slatted floored pig sties, where the wastes are contained in pits directly under the pig pens. This method has been accepted and widely used by the larger and more intensive farms which see the advantage of a considerable reduction in the quantity of water utilized. Studies conducted by the Government Research Institute have found that under such housing the quantity of waste per pig per day was reduced to 1.1 gall. as compared to the other more conventional methods where wastes per pig per day could be in excess of 6 to 20 galls. Although this practice prevents the indiscriminate discharge of waste from the farms and allows a certain degree of digestion, the problem of disposal remains. The effect on the pigs from the gases released from below the pens warrants some studies also.

While consideration has been given to the construction and maintenance of a centralized pig waste treatment plant, estimates show that this would be beyond the present economic capabilities of most of the pig farms in Singapore.

It is generally recognized that there is no singular solution to the pig waste problem. Disposal will cost money and will add considerably to present production cost. Subsequent to a comprehensive study tour of Japan on pig waste disposal and utilization (Ho 1973) in his report advocates a flexible approach to allow individual farms to adapt the least cost and the most practical method available. The recommendation includes reduction of the polluting load by removal of the solid waste either at source or after washing by mechanical separators, filtration or sedimentation. Other recommendations include "zero-discharge" with no treatment but removal for the smaller farms and on-the-farm treatment for the larger farms where, economics favour such a process. The report also urged consideration for removal of waste from farms and subsequently either to treat these centrally or dispose them at sea.

Poultry Farming

The production of chicken meat and hen eggs is a prominent feature of animal production in Singapore. The chicken are mainly kept in mixed farms which also keep pigs and ducks together with other forms of horticulture. Duck production is limited to an estimated output of 2.5 million birds annually which has a value of over \$6.5 million.

Although improved breeding stock have been imported into the country since the early 1950s, substantial development of the chicken industry only began from 1965. The total number of fowls (breeders, layers and meat birds) increased from 18 million in 1965 to 25.4 million in 1972 (an increase of 41%). The most significant improvement has been in the hen egg industry which increased production from 240

Table 2. Distributon of layer flock*

Size of layer flock	1970	1971	1972
100 or less	3,453	2,574	1,976
101 to 1,000	1,526	1,359	1,088
1,001 to 5,000	844	836	814
More than 5,000	101	127	137
Total	5,924	4,896	4,012

* Farm licensing data

million in 1965 to 378 million in 1972 (an increase of 57%). This increase in production is principally due to the increased number of layers kept in the farms as there has been a reduction in total number of farms as shown in Table 2.

Continued importation of genetically superior breeders, improved management, nutrition and better disease control measures contributed significantly to increased productivity. Random sample tests for layers conducted at the Government Research Institute showed that layers with superior genetic make-up provided with good management, nutrition and a sound disease control programme performed almost as well as other layers under more favourable conditions. The 5th progress report of the 3rd random sample test for layers at 45-56 weeks of age show a test average of hen house egg production at 156.45 with one particular entry attaining a figure of 198 eggs per hen house.

Despite the substantial increase in productivity of the laying hen there has been a decline in the margin of profit. The price of egg declined from 9.4 cts per egg in 1967 to 8.1 cts per egg in 1972, underlining the need that further intensification would be necessary to overcome reduction in profit margins on the returns per hen house.

The poultry meat industry until recently has been dominated by the so-called meat birds which are generally a cross between the heavier strain of New Hampshire female and the red or white Cornish male. Statistics again show that there is a distinct trend towards the keeping of larger flock as shown in Table 3.

Table 3. Distribution of meat bird flock*

Size of meat bird flock	1970	1971	1972
100 or less	7,784	7,615	6,466
101 to 1,000	2,705	2,597	2,292
1,001 to 5,000	1,288	1,314	1,299
More than 5,000	110	167	188
Total	11,887	11,693	10,245

* Farm Licensing Data

In practice more intensive forms of husbandry can be seen. Mechanization taking the form of automatic feeders and drinkers are more evident in the meat bird industry than in the other forms of livestock production in the country.

The broiler chickens were introduced into the country some five years ago and have established themselves and are presently contributing towards an estimated annual production of about 6 million broiler chicks, a quarter of which are exported to neighbouring countries. Its superior performance over the traditional meat bird types have ensured that its number would continue to grow at a more rapid rate in the next few years. Greater intensification can be expected from the larger chicken meat growers following their acceptance of the broiler chickens as they possess the management and technical know-how to maintain increased number of stocks. In meeting with the trend of a modern poultry industry, two poultry processing plants have been established with the fading prejudice of a new generation of consumers against dressed frozen meat. At the same time vertical integration have been introduced among some of the larger poultry enterprises. Simple projections show that the entire requirements of poultry meat could be met by 3% (300) of the existing poultry meat growers if these quickly assume the capacity to keep up to four times its present number of birds. However, before such a level of intensification could be attained, various limiting factors would have to be overcome.

An important limiting factor has been the inability of the broiler breeders to achieve optimum performance under humid tropical environment, resulting in the relative high cost of the broiler chicks. Although the broiler chicks themselves are capable of attaining the same level of production efficiency as broilers kept under more favourable climatic conditions, the broiler breeders are found to have a 20% reduced efficiency in terms of number of eggs produced, egg size, fertility and mortality during production period. The solution to this problem could be either in the form of providing favourable housing which would reduce the climatic stress or the selection of heavy breeders which could perform optimally under the humid tropical environment. Success would contribute greatly to the reduction in the overall cost of producing chicken meat in the tropics.

Conclusion

Animal production in Singapore is passing through an important and crucial phase of development; its future being closely associated with the limited land resources and the pace of the other forms of development in the country. Competing land use, further reduction in profit margin and the problem of pollution to the environment from animal farming activities particularly that of pigs necessitate that the emphasis for future livestock development is the establishment of larger and more intensive units of production. The trend of development in pig and poultry farming in the country shows that the livestock industry is capable of far greater intensification than that presently achieved.

The process of intensification will result in the displacement of the majority of the small farms who have all along lacked the financial capacity and technical expertise to grow and expand with the industry. Intensification will introduce expertise both foreign and local and also a considerable degree of vertical integration into the industry. It will also upgrade farming practices, generate greater sophistication in management and demand higher standards of disease control measures. The final objective would be the creation of industrialized farming in the country.

Discussion

Y. Kinoshita, Japan: In the case of slurry pits method, when rainfall increases, the volume of waste overflows, how much is the rainfall on this case?

Answer: It is 80 to 120 inches in a year and the largest is 1 inch a day.

M. Naito, Japan: How do you manage about the supply of feed for pigs and poultry? I mean, do your farmers use formula feed from big feed company or self-supplying?

Answer: Raw ingredients for animal feed are entirely imported from international sources. There are mainly processed in the 4 large feed mills and a number of other feed mixers which together produce 500,000 tonnes of prepared feed.

The majority of the farmer purchase the formula feed from the feed millers. However a considerable percentage do mix their own feed—a greater number of whom are big farmers. Similarly a greater quantity of grower and finisher feed are mixed by the farmers.

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