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PROSPECTS FOR THE DEVELOPMENT OF THE  
BEEKEEPING INDUSTRY IN  
UGANDA.

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The paper discusses development patterns in the industry in developed and underdeveloped countries. The present state of beekeeping in Uganda and the history of the industry are outlined. Finally an attempt is made to show how the existing industry could be developed and the financial implications of this are briefly discussed.

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"While Honey is in Every Flower, no doubt  
It takes a Bee to get the Honey out."

ARTHUR GUINTERMAN, A. Poet's Proverbs

## INTRODUCTION

### The Products of Beekeeping

There are two major economic products of beekeeping, honey and beeswax. Minor products available under specialised management systems include Bee Venom, and Royal Jelly. These last two are at present of such minor importance and so specialised that they will not be considered further in this discussion.

#### 1. Honey:

Honey comprises the carbohydrate food of the honey bee. The bees collect nectar from flowers, store it temporarily in a false stomach and on return to the hive regurgitate it into the comb. Nectar in flowers is a weak solution of sugars and contains a variable quantity of water usually in excess of 60%. If stored in this condition the nectar would ferment. It is therefore submitted to a systematic process of dehydration. It is sucked up by a bee into the honey stomach, water is absorbed, and it is then regurgitated into the comb. The process is repeated until the water content has been reduced to about 15%. As well as undergoing dehydration inside the bee certain chemical changes occur (possibly enzymic) but these are as yet imperfectly understood. In this state the product is known as honey. When the comb is filled with honey the bees seal over the cells with wax cappings. Honey is therefore a concentrated solution of mixed invert sugars containing small quantities of minerals and vitamins and about 15% of water. In this condition it will keep almost indefinitely without fermentation setting in; it may however crystallise, but can be returned to the liquid phase by gentle, indirect, heating.

Honey is an extremely variable product. The colour, viscosity, and flavour will vary enormously depending on the source of the nectar. Colour varies from almost colourless (Clover Honey); to red (e.g. Eucalyptus Honey) to almost black (e.g. Hawthorn and one unidentified sample from Kigezi). Viscosity varies from extremely viscous (e.g. Eucalyptus or Heather Honey) to very fluid (e.g. Clover Honey). Flavours are as variable as the number of species from which bees collect nectar.

#### 2. Beeswax:

Beeswax is a natural wax secreted by the honey bee and used in the construction of honey comb. It is of a complex structure chemically. A full account of the subject can be found in Callow 1963. In order to produce one pound of wax it has been estimated that fifteen pounds of honey are consumed by the bees. It can be seen therefore that there is an antagonism between the production of honey on the one hand, and the production of wax on the other. This antagonism leads to differences in management practice depending on whether the primary objective is the production of honey or beeswax.

The General Pattern of Beekeeping Development

Honey is a natural product which has been sought after by man since the late palaeolithic period and possibly earlier. The earliest record of man's interest in honey is the cave painting near Valencia in Spain (Fraser, H. Malcom, 1951). The painting depicts a woman collecting honeycomb from a colony of wild bees in a hole in a cliff. This represents the Honey Hunting stage in the development of beekeeping, and this method of obtaining honey is still extensively practised in the more primitive parts of East and Central Africa.

The second stage in the development of beekeeping was the construction of hives, which wild swarms were then induced to inhabit by treating them with various preparations attractive to bees. We have no knowledge of how these hives were constructed or of the materials used, but it is extremely likely that they differed little from the hollow log, pot, or similar structure used extensively today in East Africa. The advent of the beehive marked a large step forward in beekeeping, for now the beekeeper had ready access to honey, without the necessity for searching out wild colonies in the forest. In Egypt this development had certainly taken place by 4000 B.C. and bees had by this time (The First Dynasty) assumed major importance. The Royal Title included "King of the Bee Land (Lower Egypt) and the Reed Land (Upper Egypt)" from this time until the Royal Cartouche ceased to be used during the time of the Roman Emperors (Fraser H. Malcom 1951). Thus by 6000 years ago Beekeeping had moved, in Egypt, from the Hunting Stage of culture to the Husbandry Stage, granting that the husbandry was still primitive.

This system persisted (as did the pastoral systems of animal husbandry generally) for a considerable period of time. In fact with minor variations in type of hive used this same basic system lasted throughout the world until 1851 A.D. It was in 1851 that an American-Lorenzo Lorraine Langstroth discovered what came to be known as the "Bee Space". This discovery - that whatever the receptacle in which the bees lived they always left a gap of five sixteenths of an inch between combs (by means of which they gain access to the combs), opened the way for the development of the frame hive. Langstroth followed up his discovery and developed the first frame hive. It comprised a wooden box with wooden frames in which the bees are encouraged to construct their comb. A Bee Space is left around each frame. This innovation resulted in a great leap forward in beekeeping, and knowledge of bees generally. Frames can be removed, inspected, and replaced at the will of the beekeeper. Glass walled observation hives were developed and probably in the 40 years between 1875 and 1915 more advances were made in knowledge of the biology and behaviour of bees, than during the preceding 6,000 years. With the advent of the moveable frame hive, beekeeping moved from the pastoral husbandry level to an intensive management level.

Thus we can summarise the development of beekeeping into three definite phases:

- a) Honey Hunting: This involves no investment and no management. The element of chance is high and the time necessary to locate wild colonies of bees can be great. This system depends on the availability of large numbers of wild colonies, and is

associated with the underdeveloped regions of the world where large areas of natural forest are found.

b) Fixed Comb Hive: Initial investment usually nil as locally available materials are used. Management practices are severely restricted as (1) size of hive is fixed, and (2) replacement of a comb, once removed, is impossible. Management in practice can be either a periodic total removal of all contents with the consequent destruction of the bees, or periodic removal of the honey comb only, leaving the brood nest undisturbed. In this second case the colony will recover, and this undoubtedly represents a more efficient management system than the first alternative.

The element of chance is largely eliminated and the time required to harvest the crop is approximately 2 man hours p.a.

c) The Moveable Frame Hive: Initial investment is high due to the necessity for accuracy in construction. For a very simple hive of this type Ntenga has calculated the minimum cost to be Shs. 55/20 at Tabora (Ntenga G. 1968).

Management practices can be affected resulting in higher yields, and a better product.

The element of chance is here again largely eliminated, but the time spent annually will depend on the degree of management practiced and no meaningful generalisation can be made.

The first of these three is labour intensive with a high risk factor, but no capital outlay; the second again requires no capital and reduces the risk and labour components; the third is capital intensive, with low risk, and a variable labour component.

#### Beekeeping Development in More Developed Countries

Included in this group of countries are all of Western Europe, U.S.A., Canada, Australia and New Zealand. New Zealand can be used as an example of this type of beekeeping, and is selected because a considerable body of data is available due to the highly organised nature of the industry. The data quoted below is from Cook V.A. 1968.

There were no native honey bees in New Zealand until 1840 (Treaty of Waitangi) but since then a thriving industry, with some 3508 registered beekeepers keeping 194,213 beehives, has developed. All beehives are of the modern moveable frame type and the industry is orientated to the production of honey, with beeswax forming a useful byproduct.

The annual honey production (average for 1961-1967) is 5,200 tons. Of this production some 795 tons are exported in bulk to the U.K., the rest being retailed within New Zealand. The average price paid for New Zealand Honey exported to the U.K. in the year ending August 1966 was £153 (N.Z) per ton ex store New Zealand. Producers receive approximately one shilling per lb (after deductions for containers and freight) from the Honey Marketing Authority. The price paid varies with the quality of the honey, the quality being assessed on source, flavour, colour, and specific gravity.

It is interesting to examine the reasons for the success of the honey producer in New Zealand. This success is apparent

from the figure of 448 beekeepers who keep more than 50 hives, (of this number 246 beekeepers keep more than 250 hives).

The climate is temperate with plentiful rainfall and abundant sunshine, and, over most of the country, the winter is mild. These are all factors highly conducive to a successful beekeeping enterprise. This is reflected in the average yield of 65 lbs per hive over the whole country, a very high figure indeed.

The second and equally important factor is low transportation costs. A glance at a map shows that nowhere in New Zealand is far from the coast, and overland communications are adequate. Thus the honey producer faces little difficulty in getting his product to market.

The final factor lies in the product. The vegetation of New Zealand results in the production of honey which is mostly of a fine flavour and a light colour, i.e. a honey which finds a ready overseas market. This point will be returned to in later discussion.

Bees wax production figures for 1960-1966 show an average of 81 tons. This represents 1.6% of the honey production. This is a very low percentage and reflects management practices aimed at the conservation of the comb. The economics of this are relatively straight forward. As stated earlier the bees consume about 15 lbs of honey to produce 1 lb of beeswax. Under New Zealand conditions this honey would fetch about fifteen shillings. One lb of beeswax however fetches on average three shillings and nine pence. Thus every pound of beeswax produced represents a loss to the beekeeper of some eleven shillings. Even with the present record prices being paid for beeswax due to a world shortage every pound of beeswax produced in New Zealand represents a loss of some eight shillings to the producer. This situation exists throughout the developed regions of the world, and in most of these countries operates against the bee keeper to a greater extent than in New Zealand.

Thus systems of beekeeping in these countries have evolved in such a way that wax production is reduced to a minimum.

#### Beekeeping Development in Less Developed Countries

Several features of less developed countries are relevant to a consideration of beekeeping, and merit brief discussion.

##### 1. Shortage of Capital:

This operates both on an individual level and a national level. In the first case the individual rarely has capital available for an enterprise demanding high capital inputs. On the national level the need for foreign exchange is great and exportable products are essential.

##### 2. Poor Communications:

This feature usually results in high transport costs. These eat into the profit margin of the producer of even high value/low weight products to such an extent as to make production uneconomic.

##### 3. Climate:

While agreeing that by no means all underdeveloped countries are in the tropics, it is true to say that most tro-

pical countries are underdeveloped. A tropical climate has two main influences on beekeeping, one direct, the other indirect, but both very important. Firstly high temperatures promote the wax secreting glands of the honey bee resulting in a tendency found in all honey bees in the tropics towards wax production. This characteristic is found to be very highly developed in the native African Bee (*Apis mellifera Adansonii*). The second effect of climate acts through vegetation and results in the tendency of tropical honeys to be dark in colour and strong in flavour.

These factors have over the years combined to make the tropics into the major source of world beeswax production accounting for some 90% of the total production.

Tanzania has been a major world producer of beeswax for a considerable period of time, and this country is chosen to illustrate the development of beekeeping in a less developed country. Tanzania's geographical proximity to Uganda renders this choice the more instructive.

It is often an impossible task to establish production figures for products in underdeveloped countries. This applies to beekeeping products as to most other products which are both consumed locally and exported. Because of this difficulty it is usual to use export figures as an indicator of production. This can be applied readily and effectively to beeswax as there is little if any domestic utilisation. Thus export figures give a fairly reliable guide to production, although not taking into account wastage.

With regard to honey the situation is different; for honey is largely consumed domestically in one form or another. However a useful rule of thumb can be applied to calculate honey production from beeswax data. Under fixed frame beekeeping conditions wax production runs at somewhere between 5% and 8% of honey production as all the comb is harvested. (This contrasts with 2% wax production from moveable frame hives). Thus 1 ton of wax produced means approximately 20 tons of honey. Table I shows Tanzania's exports of honey and beeswax for the period 1913 to 1967. From this table the beeswax orientated nature of the industry is apparent. For instance in the peak year of 1948 some 18,000 tons of honey were produced in Tanzania yet only 37 tons were exported. Even today honey exports form only a small part of the total production.

The reasons for this state of affairs are not hard to find. In the first place the honey would have to sell in Europe below 1/50 per lb, and this price would only be achieved by a high quality honey. The average Tanzanian Beekeeper living in the Miombo region has an extreme problem with regards to getting his honey to the nearest railhead, and is then involved in the expense of railing to the coast and shipping to Europe. In these circumstances honey is a valueless by product and what cannot be disposed of locally is thrown away.

The wax however has a higher value/weight ratio and is carried out of the forest, often in headloads, and sold.

The Beekeeping Section based on Tabora started up a honey processing plant in 1954 and this has flourished now being run as a producer cooperative under the guidance of the

Table 1

Tanzanian Beeswax and Honey Exports, and Values for the Period  
1913 - 1967\*

Year	Beeswax		Honey		Year	Beeswax		Honey	
	Exports (Tons)	Value (£/\$) per ton f.o.b.)	Exports (Tons)	Value £/ton		Exports (Tons)	Value (£/\$) per ton f.o.b.)	Exports (Tons)	Value £/ton
1913	559	126			1945	795	166	153	37
1922	332	75			1946	732	259	85	48
1923	302	82			1947	410	320	118	61
1924	425	105			1948	905	288	239	54
1925	293	146			1949	525	287	37	?
1926	307	157			1950	315	510	1	43
1927	588	138			1951	673	500	36	0.8 (2)
1928	491	145			1952	599	510	554	79
1929	336	143			1953	672	386	24	104
1930	188	108			1954	285	440	11	126
1931	607	77			1955	343	478	0.5	132
1932	391	82			1956	319	536	6	92
1933	680	78			1957	482	505	1	289 (2)
1934	407	80			1958	527	461	21	112
1935	531	87			1959	403	403	106	96
1936	524	99			1960	359	433	145	129
1937	738	111			1961	642	365	334	121
1938	686	80			1962	298	387	612	89
1939	456	?	27.7	21	1963	605	399	309	98
1940	468	138	336	31	1964	533	391	602	83
1941	711	163	150	29	1965	614	377	386	98
1942	348	166	118	29	1966	599	340	648	81
1943	586	175	868	37 (1)	1967	490	510	472	629 (2)
1944	627	176	173	37					

\* Data compiled from : Annual Reports Tanganyika Department of Agriculture, Annual Reports Tanganyika Forest Department and, Beekeeping Progress Report 1949-1967 by G. Ntenga, NDB, Senior Field Officer and Head of Beekeeping Section, Ministry of Agriculture, Food and Cooperatives, Tabora.

1. Largely for consumption by the military forces based in Kenya.
2. Very dubious figures ?

Beekeeping Section. This was possible at Tabora largely due to better communications and the presence of a large well established local beekeeping industry based on wax production.

Thus in Tanzania we have the pattern of a well established industry based on beeswax production being able to foster the development of honey export industry; in effect a good example of byproduct utilisation. The history of the Tanzania Beekeeping Industry has not been one of unqualified success. Indeed it would probably be unique had this been the case. In 1940 it became necessary to bring Beeswax Exports under Government control as serious cases of adulteration with other waxes (wild bees of the genus Trigona, and paraffin wax are favourites) were prejudicing entire industry. An Assistant Entomologist was also appointed to carry out a survey of the industry and to make recommendations to the government. As a result of his report a Beekeeping Section was established with several expatriate officers and a large extension staff recruited from among local beekeepers. Although, as can be seen from Table I this section

has not been able to increase the production of beeswax it has ensured the quality of Tanzania Beeswax which is in itself an extremely valuable contribution to the industry. In addition to this it has carried out a research programme into honey producing plants, and methods of management designed to increase productivity. The present policy of the Beekeeping Section is outlined as follows by Ntenga, G. (1968):

1. Short Term: (i) Modernisation of the present bush and forest beekeeping to the maximum possible, through the use of modern hives. (ii) Improvement of methods of collecting and cleaning honey and beeswax. (iii) Organisation of the marketing of honey and beeswax.
2. Long Term: (i) Research in Beekeeping, especially in the fields of bee ecology, bee forage and breeding. (ii) Economics of intensive bee farming.

It would seem to the author that Short Term Policy (i) is to some extent responsible for the lack of increase in beeswax production. This is because the introduction of the modern (i.e. moveable frame) beehive involves a change in the direction of a "capital intensive" system of beekeeping. Add to this the development of marketing facilities for honey and the beekeeper will move towards intensive honey production as being the type of enterprise which gives him the maximum return on capital invested. Thus it would appear that the beekeeping industry in Tanzania is becoming more typical of the type of industry found in developed countries and that the swing towards honey production for export could eventually lead to a reduction in beeswax production.

#### Beekeeping in Uganda

##### A resume of the history of the industry up to the present time

###### 1) 1928-1962.

Bees have been kept in Uganda in fixed frame hives for a considerable period of time. The earliest record that we have of interest in developing the industry is found in a report, by Mr. T.W. Chorley, Laboratory Assistant, Agricultural Laboratories, Kampala dated 8/2/34, to the Government Entomologist, Kampala. This report concerns a visit made by Chorley to Masaka District in an attempt to promote beekeeping aimed at wax production. He reports that there was little interest shown in various gombololas in Buddu. The reason for this was that in 1909 a number of people from this area had been sent to somewhere in Tanganyika to learn the rudiments of wax production, but on their return their enthusiasm had been extinguished by the absence of a market for their produce! It is I think important to note this point as time and again throughout the files of the government entomologist the problems involved in the collection and marketing of beeswax are discussed. This problem will be elaborated further in the third section of this paper.

Ndwani (1968) records a ban on beekeeping in Kigezi introduced in 1928 by the D.C. as a measure to reduce drunkenness and the consequent high level of crime. Evidence suggests that



this ban made future efforts at establishing the industry very difficult in Kigezi. Chorley in his report on a tour of Kigezi to promote beekeeping (August 1940) records that many people were still suspicious that this was an attempt to discover how many people were guilty of infringing the ban.

From 1932 Beekeeping came under the Government Entomologist and his files were kindly made available to the author by the Commissioner for Agriculture and his staff. These files reflect the enthusiasm of the Entomologist, Hargreaves, and the Laboratory Assistant, Chorley, throughout the thirties and early forties. Chorley travelled extensively in Buganda and the Western Province during this period promoting the industry, writing up reports, and producing notes for beekeepers. In 1933 a Bulletin entitled "Beekeeping" was printed by the Government Printer Entebbe for the Department of Agriculture. This dealt with the manufacture of an "Improved Fixed Frame Beehive" and contained the necessary information for keeping bees and producing honey and wax.

During this period of activity several colonies of Italian bees were introduced but were found susceptible to parasitic Tachinid flies. In 1934 samples of these insects were sent for identification to Rhodesia, and were identified as Rondanioestrus apivorous Vill.. A further pest in the Conopid group was later identified by the Agriculture Department of Rhodesia as Physocephala pubescens Brunetti. This observation was the first record of the breeding habits of this later species. These examples are quoted to give an idea of the intensity of interest during this period.

Samples of beeswax were sent to the U.K. for market reports, which were mixed. It appears that the wax varied considerably in quality, and was alleged to be, in one instance, adulterated. Collection of wax was organised at this time, through the Agric. Dept. staff and, it was then disposed of through commercial channels in Kampala.

Beekeeping assistants were trained and sent out into various districts from Kigezi to Gulu (There are no records of interest in beekeeping in the Eastern part of the country during this period.) Difficulties were experienced in the efficient supervision of the staff, and eventually a consolidation programme was introduced and efforts were concentrated on selected areas, thought to be of high potential.

In 1940 Chorley toured Kigezi district and with the help of Coffee Instructors and Overseas produced the information seen in Table 2. This is the first district census on record, which would seem to be fairly reliable, but as Chorley points out in his report it is probably an underestimate as the population was suspicious of the motive behind the survey.

It would appear from the files that activity declined to almost nothing from about 1942 onwards. There are probably good reasons for this which are relevant to any new attempt to establish the industry. There will be discussed briefly.

#### 1. Staffing in the Agricultural Service.

Beekeeping is rather an esoteric occupation, and beekeepers are regarded in most societies as being somehow

Table: 2

Census of Beehives and Beekeepers in Kigezi July-August 1940.\*

County	Gombolola	Occupied Hives	Empty Hives	Beekeepers
NDORWA	Kyanamira	1168	2024	312
	Kamuganguzi	998	965	364
	Rubanda	1088	1274	88
	Bufundi	2145	1016	216
	Bubare	497	496	113
	Maziba	2486	1832	447
	Buhara	1278	2158	320
	Kabale (Township)	96	48	34
TOTAL		9744	9613	1894
BUFUMBIRA	Nyakabande	2541	1089	174
	Nyarusiza	1078	182	249
	Busanza	613	564	222
	Bukimbiri	1817	2343	219
	Chahi	480	306	139
TOTAL		6529	4484	1003
RUKIGA	Bukinda	877	563	143
	Kamwezi	605	431	185
	Nyakishenyi	539	283	157
	Kashambya	696	380	143
	Rwamucucu	1162	632	222
	Nyarushanje	513	276	152
TOTAL		4392	2565	1002
RUJUMBURA	Ruhinda	22	32	50
	Buyanja	292	111	120
	Nyakagyeme	111	89	120
	Kebisoni	168	98	101
	Kagunga	425	218	247
TOTAL		1018	548	638
KINKIZI	Kirima	230	131	100
	Rugyeoyo	242	265	145
	Kambuga	79	102	83
	Kayonza	197	203	241
	Kinaba	292	274	95
TOTAL		1040	979	664
GRAND TOTAL		22753	18189	5201

\* From. Report by H. Hargreaves, Senior Entomologist, Kawanda, dated 22nd August 1940.

This report, addressed to The Director of Agriculture, is based on an investigation by a Mr. Chorley conducted on behalf of the Department of Agriculture to assess the potential of Kigezi as a wax producing area.

"different" from other (? normal) people. This is the case in U.K., where a beekeeper who admits his occupation, or hobby, usually meets the comment "Oh, really, how interesting"! In many parts of Africa the beekeeper is also regarded as being different from others, and often is granted respect within the tribe because of his ability to control bees. The presence of Hargreaves and Chorley in Uganda at the same time was a strange trick of fate, unlikely to be repeated. Their interest in bees was not the reason for their appointments but fortunately their interest in bees was encouraged by the Agricultural Department. It follows from this that their successors, who had no private interest in bees, and who would be under increasing pressure from other work, would find it difficult to foster a beekeeping industry. Thus with a lack of interest at the top, the necessary driving force was removed, and the machine ran down. The implication of this for future development is obvious.

## 2. Marketing:

It would appear that produce marketing is the key to development in many areas of endeavour. The evidence available suggests that it is the lack of marketing facilities that have plagued all previous attempts at beekeeping promotion in Uganda. All through the files of the Government Entomologist disposal of the produce looms large.

Initially field staff bought in the beeswax on behalf of the administration. It was collected together and eventually disposed of to commercial outlets in Kampala. This was not a satisfactory procedure as field officers had no training in quality determination, storage facilities were not adequate, and often the wax was consumed by "wax moth" (equivalent to clothes moth) before it could be disposed of.

Later on Local Authority legislation was introduced in Kigezi and certain traders were licenced to deal in beeswax. This relieved the administration of an unwelcome job but acted against the interest of the industry, as now the producer was forced to travel to Kabale to sell his wax. It would be unlikely, at this time, that any individual producer would have more than a few shillings worth of wax, and the reward for getting it to Kabale was clearly not worth the effort involved. Thus by 1957 the trade had declined to an extent where the legislation was rescinded and Kigezi ceased to be designated wax producing area. Similar, though less well documented, trends occurred throughout the areas which had promised well initially. It is likely that had a viable marketing scheme been in operation then beeswax production would have continued in Kigezi. It can be assumed from Chorley's data (Table 1) that at least 23,000 lbs of wax were being produced annually, and thrown away as a useless byproduct, the honey used in beer making being the main reason for beekeeping.

Another item of interest from the Entomologists files relevant to us here was the enactment by the three E. African Governments of legislation to control imports of bees, bee equipment, and bee products, in order to safeguard the beekeeping industry from diseases. This matter was raised by the Beekeeping Section in Tanzania about 1956 and it is interesting to note that Chorley is on file as having recommended this in Uganda in the early thirties!

One other item of interest from these files is the attempt in 1958 to introduce beekeeping on the planned farms. It would appear that this also failed due to lack of information and

qualified personnel.

Interest in beekeeping shifted eastwards in the 1950's. Mr. Eric Johnson of Ongino Leprosy Centre, Kumi, Teso - an enthusiastic beekeeper - began investigations into the local bee and constructed moveable frame hives of the Langstroth type. These proved unsuitable and expensive and in cooperation with Mr. Hubbert of the Beekeeping Section (Tanzania) and Mr. Townley of Messrs. Kenya Apiaries Ltd (Nakuru), the African Long-hive was evolved. This has most of the advantages of more standard frame hives, while at the same time being cheap (relatively) to construct and simple to operate. It is in many respects a half way stage between the "Log-Hive" and the "Langstroth Hive".

Over the years Mr. Johnson's enthusiasm spread and he produced a booklet for use by the Department of Agriculture in the Eastern Province, and organised courses for interested local beekeepers. The Agriculture Department organised the supply of subsidised African Long Hives, and two Agricultural Assistants (Bees) were appointed for extension duties. Pressure of other duties eventually forced Mr. Johnson to reduce his beekeeping activities, although he still has about 30 hives at Ongino.

It would appear that Mr. Johnson was unaware of the previous work done by the Agriculture Department on beekeeping in Uganda. This is probably due to the fact that the previous work had been concentrated in the Western Region.

ii) 1962-1969:

Responsibility for Beekeeping had moved from the Department of Agriculture to the Department of Animal Industry, Game and Fisheries by the publication date of Uganda's Current Five Year Development Plan (Work for Progress, Uganda Second Five-Plan).

Beekeeping Development appears on P.74 (Ch. IV Section 21.). Projected targets appear in the Table of Gross Output estimates on P 76 but there is no detailed discussion of proposed methods of reaching these rather optimistic targets. Nor is there to be found any estimate of the cost of this development.

In 1966 the author joined the Faculty of Agriculture at Makerere, and being already a beekeeper, designed a programme of research into beekeeping with a view to establishing:

- a) The extent of beekeeping in Uganda and its potential for development.
- b) The productivity of the local honey bee under various management systems (local fixed frame hive and modern moveable frame hive).
- c) The part played by bees in pollinating important local crops.

Only section a) of this programme is of interest to this discussion.

In November 1966 a national census of beekeepers was conducted by the field staff of the Ministry of Animal Industry, Game and Fisheries. The results obtained (Table 3) were rather

Table: 3

National Survey of Beekeepers & Beehives December 1966\*

Distric	No. of Beekeepers	No. of Beehives
Kigezi	2,286	9,241
Ankole	830	2,360
Toro	None	None
W. Nile	168	400
Buganda	53	93
Bunyoro	No Response	No Response
Acholi	No Response	No Response
Lango	None	None
Busoga	None	None
Bukedi	2	2
Bugisu	13	13
Sebei	48	426
Teso	54	91
Karamoja	Not possible to count but few with most honey obtained by Honey Hunting	
Total	3,454	12,626

\* Data from a national survey carried out by the field staff of the Ministry of Animal Industry, Game and Fisheries on behalf of E. Roberts, Faculty of Agriculture, Makerere University College.

disappointing. It appeared that Kigezi was potentially the best area, but even here a decline was evident by comparing the figures county by county (Table 4) with those of Chorley (1940) (Table 2 page 9).

Kigezi District

The possibility of error in a survey of this type is enormous, as one is completely at the mercy of a large number of already overworked field officers, to whom the census return, is an unwelcomed extra burden. In order to check on the accuracy of this census it was decided to conduct a sample survey. Kyanamira sub-county of Nderwa county was selected for two good reasons; in the first place a huge decline in beekeeping

Table: 4

Census of Beehives and Beekeepers in Kigezi December 1966. \*

County	Gombolola	Occupied Hives	Empty Hives	Beekeepers
NDORWA	Kyanemira	173	82	35
	Kamuganguzi	-	-	-
	Maziba	125	135	105
	Buhara	1164	554	167
	Kabale (Township)	235	234	23
	Rubanga	711	264	158
	Kitumba	-	-	-
TOTAL		2408	1269	488
BUFUMBIRA	Nyakabande	605	355	131
	Busanza	125	126	41
	Bukimbiri	830	65	83
	Chahi	98	50	108
	Nyamsiza	240	120	52
	Nyabwishenya	107	140	21
TOTAL		2005	856	436
RUKIGA	Bukinda	414	716	93
	Kamwezi	150	200	23
	Nyakishenyi	286	102	42
	Kashambya	490	349	102
	Rwamacucu	484	457	100
	Nyarushanje	419	188	169
TOTAL		2243	2012	528
RUJUMBURA	Ruhinda	6	12	4
	Buyanja	-	-	-
	Nyakagyeme	-	-	-
	Kebisoni	30	15	8
	Kagunga	196	94	45
	Bugangari	90	45	50
TOTAL		322	166	107
KINKIZI	Kirima	267	159	106
	Rugyeyo	131	105	61
	Kambuga	236	85	81
	Kayonza	86	62	45
	Rutenga	-	-	-
TOTAL		720	411	248
RUBANDA	Bubare	768	251	200
	Ikumba	668	1559	258
	Bufundi	107	138	10
	Muko	-	-	-
TOTAL		1543	1948	478
GRAND TOTAL		9241	6662	2286

\* Data from a national survey carried out by the field staff of the Ministry of Animal Industry, Game and Fisheries on behalf of E. Roberts, Faculty of Agriculture, Makerere University College.

was suggested by a comparison the two surveys; and secondly because Mr. Ndwani (whose special project this work became) had useful local connections. Ndwani covered the sub-county on foot and by bicycle visiting each beekeeper and personally counting the beehives each possessed. His task was made easier by the fact that most beekeepers in this sub-county tend to keep their beehives near the house in a definite apiary rather than scattered in the bush. Ndwani's results are shown in Table 5.

Table 5

County	Sub-County	No Bee-keepers	No Occupied Hives	No of Empty Hives
Ndorwa	Kyanamira	175	1560	1111

This result cast considerable doubt on the reliability of the figures from the National Census, but agreed remarkably with Chorley's 1940 survey. It would appear that in Kyanamira the total number of beekeepers has declined markedly during the past 25 years but the average size of holding has increased from 3.75 to 15.1 hives, more than maintaining the total number of occupied hives.

It would appear that in the absence of evidence of the type obtained by Ndwani for each sub-county in Kigezi, then Chorley's 1940 census provides the most reliable indication of the state of the industry in this district.

During his survey Ndwani discovered that the Christian Rural Mission in Kigezi sponsored a Mr. Tinyara who lives on the outskirts of Kabale to process honey collected by the field staff of the C.R.M. This was then sold into the Kampala Retail Market through the U.D.C. This scheme, started in 1964, is to the authors knowledge the only serious attempt so far made to process and market honey commercially in Uganda. The collapse of this scheme during 1967 owed something to lack of knowledge, and experience, and something to human frailty. It was a well intentioned step in the right direction; however the producers who were again left with no market for their product are going to be less ready to gear up production the next time an attempt at marketing is made, and this is rather a serious repercussion. The saying that "The Road to Hell is Paved with Good Intentions" seems an appropriate epitaph for this scheme.

Ndwani's work, and that of the author agree in that there is in Kigezi no great trade in honey. Trade is extremely local, almost the total production being converted into alcohol for domestic consumption. This lack of an existing marketing structure means that any development of the industry will be the more difficult. This point is discussed more fully in section three of this paper.

West Nile District.

During 1967 also, Mr. Ruvwa, another student in the Faculty of Agriculture, conducted a more general survey of beekeeping in West Nile District. It was not possible to obtain accurate information on the numbers of hives here, as, due to false information having been disseminated at the time of the National Census to the effect "that the Government was sending someone to buy their honey" Mr. Ruvwa had, in several places, a warm reception which soon became hot when the beekeepers discovered that he had not come to buy their honey. His evidence suggests, however, that although the National Census figures are an underestimate, the industry in W. Nile is not on the same scale as that of Kigezi.

Teso District.

During 1967 the author was introduced to Mr. Johnson of Ongino Leprosy Centre, Kumi, Teso. Mr. Johnson painted a picture of beekeeping in Teso completely at variance with the returns of the National Census. On following up this information it was discovered that the field staff had counted only modern (moveable frame) hives introduced by the Department of Agriculture under Mr. Johnson's guidance. Even here later work shows their figures to be an underestimate. Mr. Johnson also intimated that there exists a considerable trade in honey through Soroti to Nairobi where it is fermented by Brewers.

During 1969 (April-June) Mr. Omwatum conducted a survey of Teso district which will form his Special Project to be submitted in 1970. Some of his data is seen in Table 6 and bears no relationship to the data obtained from the National Census (Table 7). It was not possible to obtain reliable information from the businessmen supplying the Nairobi market, as different answers were obtained on different occasions. It seems likely however that the figure of 10,000 debbes p.a. is of the correct order, and this figure is used until more reliable data is available.

This honey is produced almost exclusively from loghives, and is sold without any processing. It is likely that a debbe of this raw honey would contain 2 lbs clean wax, and about 45 lbs of honey the rest being dross. There is no attempt by the Soroti handlers to extract the wax as it is stated that the brewers will not buy extracted honey as they have no guarantee of purity. Neither is there any attempt made to grade the honey, quality being apparently immaterial to the Brewing Industry.

From the above figures it would appear that about nine tons of clean wax, and something over two hundred tons of honey are exported from Teso annually. Moreover there exists a marketing structure which Omwatum investigated and reports on as shown in Table 8.



Table: 6

Information obtained by Omwatum (in connection with his special project) with the assistance of the Administrative Secretary, Teso.

County	Modern Hives	Local Hives
Amuria	34	5,985
Kumi	50	80
Bukedea	1	66
Soroti	6	163
Kaberemaido	18	789
Usuk	7	3,500
Ngora	-	2
Total	119	10,678

Table: 7

Census of Beekeepers and Beehives in Teso District  
November, 1966\*

District	Beekeepers	Beehives
Amuria	35	65
Kumi	8	11 +
Bukedea	4	6
Soroti	2	4
Kaberemaido	3	3
Usuk	2	2
Total	54	91

\* Abstracted from a national survey carried out by the field staff of the Ministry of Animal Industry, Game and Fisheries on behalf of E. Roberts, Faculty of Agriculture, Makerere University College.

+ From the authors personal knowledge this figure is erroneous as E. Johnson at Ongino has about 30 hives!

Table: 8

Price Structure & Gross Margins in Honey Marketing\*

	To Beekeeper	To Retail Buyer	To Soroti Wholesaler.
Price/lb	-/40	-/65	-/90
Gross Margin	-/40	-/25	-/25

\* Data from Omwatum 1970.

This marketing structure has evolved without government assistance, and reflects two important aspects of the industry in Teso. These are firstly, good internal communication in the district facilitating the collection of the crop into Soroti, and secondly, the existence of a good market in Nairobi connected to Soroti by adequate transport facilities in the form of the railway.

We have therefore the picture of the beekeeping industry in Uganda at the present consisting of two large centres of activity. The first, Kigezi, being orientated towards domestic consumption, while the second, Teso, is already Trade orientated.

Prospects for Development

Products and Markets

Throughout Uganda at present, with the exception of Teso District, honey is consumed locally and the wax is discarded. Teso district at present supplies a large quantity of crude honey (mixed with wax) to Nairobi. Examination of possible developments are best considered in the perspective of world patterns of trade.

Beeswax

Utilisation patterns have changed radically in recent years. Today the cosmetics and armaments industries are the major consumers. The former is prevented from substituting synthetics in the U.S. (major consumer) by the Pure Food and Drug Act which would seem unlikely to be repealed. In the case of armaments, quality is rarely sacrificed due to increasing costs. Thus future demand is unlikely to weaken. Recent expansion in both these industries and a limited supply has resulted in price increases of more than 100 per cent over the period 1939-59. During this period the price moved as high as £500 per ton. The result is that those traditional users, that are able to have moved into synthetic substitutes. The best example of this is the Polish Industry.

The major areas of consumption lie in the developed countries of Europe and North America, while 90 per cent of the production comes from the underdeveloped tropical regions of the world. Crane (1965) calculated the following figures on the basis of 1931 exports, Tropical Africa, 3,500 tons; Tropical America 1,400 tons; Tropical Asia 400 tons; the rest of the world 600 tons. There is no reason to suspect that this balance has shifted very far since then.

During the last two years the South American industry has been largely destroyed due to an unfortunate attempt at developing a new strain of bee which turned out to be unproductive and extremely vicious. The result of this loss of supply was a phenomenal increase in price during 1967. This is reflected in figures quoted in an article in the Wall Street Journal (24/8/67) which stated that during the previous year New York prices had risen from \$1,456 per ton to \$2,688 per ton. It is likely that the price will stabilise again at something over £(S) 400 per ton during the next few years when the South American Industry recovers.

A rough estimate of 20 tons can be made for Uganda's present production. This figure is derived from the data as shown below in Table 9.

Table 9: Potential for Wax Production in Uganda

Teso	20,000 lbs.
Kigezi	22,000 lbs.
Ankole	2,360 lbs.
W. Nile	400 lbs.
Rest.	500 lbs.
Total	45,260 lbs. (approx. 20 tons)

(basis for calculation: 1 lb. clean wax per hive.)

Thus even if all the present production could be collected and exported, it would not compare with Tanzania's production (see Table I page 6 ), and would fall very far short of the Gross Output Target of 300 tons envisaged in the current Five Year Plan. This however should not deter development of this product for which there would seem to be a bright future, but rather it should result in a reappraisal of the Targets and their readjustment to a more realistic level.

Honey:

Honey in an undeveloped country serves two purposes. It is a ready source of liquor, and it is used as food, especially as a sweetener. (Both of these uses existed in the U.K. and many other countries in former days). With the rise of sugar as a universal sweetener, and the cereals as a source of alcohol, honey has changed its product image very successfully in most developed countries and has become associated with luxury. The demand is high and prices have moved up. There is also, at least in the U.K. a premium for 'Local Brands' which can fetch up to 7/= per lb.

This luxury market generally prefers a light coloured honey with a mild flavour while tropical honeys, as pointed out earlier, tend to be dark and strong. Several honeys of this type have however recently moved well after the establishment of a suitable product image! To break into this market in Western Europe and North America would necessitate a high quality product landed in the consumer country at less than 1/50 per lb. Uganda's geographical position and consequent expensive freight charges mitigate against this possibility but the situation is by no means hopeless.

There is in fact a luxury market within Uganda as shown in Table 10.

Table 10

Imports of Honey into Uganda 1963-1968*		
Year	Quantity centals	Value (Sh)
1963	107	25,720
1964	303	63,640
1965	226	48,400
1966	463	88,420
1967	243	47,480
1968	1003	50,680

\* Figures supplied by the Statistics Division, Ministry of Planning and Economic Development.

Although these figures show a rather erratic demand there appears to be a general upward trend indicative of an expanding market within the urban population. Thus even if it is not immediately possible to break into the world market a saving of some Sh.50,000 p.a. to foreign exchange could be effected if a satisfactory local product was available.

### Suggested Pattern for Future Development

Up to this point we have been considering facts which are undisputable. We move now into the realm of opinion. Probably the simplest method of expressing these opinions is in the form of answers to a series of questions, and this will now be attempted.

1. Development Where? It would seem logical to develop initially what already exists rather than to start from nothing. It is unfortunate in the extreme that the two main centres of beekeeping activity (Kigezi and Teso Districts) are so widely separated geographically. To develop both simultaneously would involve spreading available resources too thinly to do justice to either. The choice has therefore to be made. For several reasons Teso District is the better choice. These include:
- a) Better external communications with lower transport costs for exports than those of Kigezi.
  - b) Better internal communications than Kigezi.
  - c) Presence of an existing trade in bee products resulting in receptive attitudes towards development.
  - d) History of extension effort.

2. Development Aims and Priorities

- i) To stabilise the existing industry by market control, and to promote the marketing of bee products.
- ii) To improve quality of product from existing hives.
- iii) To increase the number of local hives thus expanding the industry.
- iv) To encourage the use of modern methods including moveable frame hives.
- v) To conduct research into such aspects of beekeeping as may from time to time be deemed necessary.
- vi) To expand the development programme to other areas of the country.

are

The aims listed above/arranged according to the author's opinion of priority. The aims and priorities will now be justified in detail.

i) The existence of a trade in bee products is the basis on which development is planned. Omwatum reports dissatisfaction expressed by beekeepers with the great fluctuations in the price paid to producer. Indeed it is reported (Omwatum) that the Teso Cooperative Union attempted to market honey for a two year period but discontinued due to incurring losses. How this could have happened is difficult to imagine!

The logical approach would seem to be, in the first instance, to replace the four wholesalers presently supplying Nairobi with a Honey Marketing Authority. This could be carried out fairly painlessly to the industry (though not to the wholesalers) by legislation. The primary buyers would then sell to the authority who would handle all the external trade in bee products for the District. This authority could then establish a price structure for bee products and effectively control the market. There would seem to be no reason why any disruption in the service to the Nairobi consumers should occur

provided that this operation is well planned.

Once operational, the Honey Marketing Authority could "cream off" the better honey passing through its hands, extract it and satisfy Uganda's internal market for high quality honey. The wax produced in this way could also be disposed of commercially.

Eventually this Authority should seek out overseas markets for high quality honey as this becomes available during development of the industry.

ii) It is a widely held belief that good quality honey can only be obtained from "modern" moveable frame hives. This is not true, excellent quality honey can be obtained from the existing local hives. What is required is extension effort to improve the dexterity of the beekeeper in harvesting and the subsequent handling of his honey. It is necessary for instance for the beekeeper to know different grades and qualities of honey and to keep these separate during and after harvest. It is also necessary to emphasise the need for scrupulous attention to cleanliness with regard to the product.

Given adequate extension guidance the beekeeper will tend to improve his husbandry in response to a price differential decreed by the Honey Marketing Authority. Some education of the primary buyers would also be necessary.

iii) Once the price structure and marketing organisation is stable very little incentive will be necessary to promote growth in the industry.

iv) As with most areas of agricultural endeavour, modern methods pay in beekeeping. However, the moveable frame hive is an expensive piece of equipment and is unlikely to outyield the local hive unless husbandry of a high standard is applied. Thus the provision of modern equipment must take second place to the improvement of husbandry. Provision of moveable frame hives at highly subsidised prices without prior improvement in husbandry would be equivalent to supplying nomadic herdsmen with exotic cattle.

v) While acknowledging that research is useful in any enterprise, in this instance it merits a low priority for one very simple reason. There is already a large body of research findings available through the Bee Research Association which has an African centre at Tabora. Problems of general nature have in many instances been solved, and where they have not then it is doubtful whether Uganda is the correct venue for their solution. Problems of a particular nature, e.g., floral resources of the region, and investigation of local pests, would need on the spot attention, and provision for this type of work should be made.

vi) Expansion of this programme to other areas: There would seem to be no reason why parts of Lango and Acholi could not be successfully developed. From a vegetation and rainfall consideration they would seem suitable. Thus development could follow the railway westwards into West Nile. Karamoja would seem to be largely unsuitable due to lack of water.

The development of the Kigezi industry could probably be successfully achieved, at a later date, when the industry in the North East is strong enough to support this development in its initial stages.

How can these aims be achieved? This is of course the \$64,000 question. Our knowledge of bees, beekeeping, and bee products has increased to an amazing degree in recent years. The standard textbook on the Anatomy of the Honey Bee (Snodgrass 1956) runs to over 300 pages. Two international journals on the scientific aspects of Beekeeping and an 'Abstract' of all work on bees reported, appear regularly from the (International) Bee Research Association. In addition to this a very large number of smaller national journals exist. Thus beekeeping in the modern world is a highly specialised occupation and the modern beekeeper is a specialist of a high order.

These facts emphasise the need for establishing within the Ministry of Animal Industry Game and Fisheries a Beekeeping Section. It is unrealistic to attempt to fit this type of specialized work within any of the existing sections of the ministry, as none of the existing staff can have the knowledge or the time to adequately supervise the development envisaged here.

The Beekeeping section should be the Honey Marketing Authority, and would also need extension staff.

Staffing:

1. General Policy:- Beekeeping is not an all the year round activity. For most of the year there is little work to be done, while during the harvesting of the honey a sharp peak of activity occurs. A similar pattern of activity would manifest itself in the Beekeeping Section. It is a well established practice in many countries, including the U.K., to recruit temporary staff during peak activity. This system has the advantage of keeping the number of permanent staff down to a level where they can be employed fully within the section, while allowing flexibility to cope with peaks of activity. This practice is advocated for Uganda.

2. Permanent Staff:-

a) Head of Section: The whole operation will stand or fall on the performance of this person. He should be a beekeeper of considerable experience, and should hold the National Diploma in Beekeeping or an equivalent qualification. He should, if possible have experience of the African bee. Above all he should be an extremely "practical" person, able to undertake the manufacture of equipment and the training of his staff. This person would probably have to be recruited initially from outside Uganda and provision made for counterpart training.

b) Beekeeping Officers: Probably five posts would be necessary initially for this scheme, with further posts added as expansion proceeds. These men should be well educated (Cambridge O Level), with a good background in beekeeping, and a practical bent. They should also have the personality characteristics necessary to enable them to be effective extension officers.

3. Temporary Staff:- These should be recruited as and when the situation demands from among the ranks of the better beekeepers.

Salaries:

a) Head of Section: (assume donor financed)	-----
b) Counterpart: 1 at Sh. 5,000/-	15,000
c) Beekeeping Officers: 5 at Sh 6,000/-	30,000
d) Temporary Staff: say Sh 5,000	5,000
	-----
Total Salaries	Sh. 50,000

Accommodation and Equipment: Requirements.

1. Staff housing for permanent staff.
2. Honey Factory and Store.
3. Demonstration Centres and Apiaries.
4. Workshop.
5. Office.

The author is at present not in a position to estimate the cost of these items of Capital Expenditure.

Accommodation and Equipment: Location

Soroti would seem the obvious choice for the Honey Factory and store for two reasons, firstly, existing secondary buyers are located in Soroti, secondly the proximity to the railway station.

Beekeeping is a Rural Occupation and the possibility of close co-operation with Arapai Rural Training Centre, especially with regards to the organisation of courses etc., would seem to offer many advantages and should be fully explored.

Travelling:

Obviously if effective extension work is to be carried out then a considerable amount of travelling will be necessary. Whether a Section Vehicle should be acquired or whether a system of car (or bicycle) allowances would be more economical is something that requires detailed calculation. For present purposes an estimated requirement of Sh 30,000 per annum is made.

Income:

1) Existing business One may safely assume that the present wholesalers make some profit. From Omwatum's figures (see Table 8, page 17) it would appear that their gross margin is on average about -/25 per lb. This gives a total gross margin on 10,000 debbes of the order of Sh 125,000 assuming 50 lbs. per debbe. Their expenses will include provision of containers, about Sh 30,000 and freight charges Soroti to Nairobi say Sh 30,000. This leaves an income of some Sh 65,000 per annum accruing to the beekeeping section.

2) Satisfaction of present luxury retail market. The local market consumes approximately 391 Centals per annum (average '63-'68 inclusive). This market will undoubtedly expand. An estimate of the income accruing from this source can be derived as follows:



1. Price paid to producers of high quality honey	Sh 1/- per lb.
2. Cost of containers	-/50 " "
3. Transport, wastage etc., say	-/50 " "
<hr/>	
Total costs delivered retailer -	Sh 2/- per lb.
Price paid by retailer	Sh 3/- per lb.
Profit per lb.	Sh 1/- per lb.

∴ Net Profit on 591 Cents = Sh 39,100.

3) Beeswax:- This is the most difficult item to assess as there are so many unknown factors here, and the development of this side of the industry would have to be played by ear.

In theory as the wax is not required by the brewers except to ensure the quality of the product then the Honey Marketing Authority should be able, after consultations with the brewers, to remove the wax and assume the guarantee for the genuineness of the product. If this could be agreed to then some 20,000 lbs. of wax could be salvaged, purified and exported realising an income of some Sh 96,000 (assuming a price of £400 per ton). Of course, should the Nairobi Brewers be unwilling to permit this, then it would not be worth jeopardising the market by insisting on it.

#### Profitability of the Enterprise:

From the above it can be seen that an initial income of Sh 104,100 would be available without much effort, with a further Sh 96,000 which could be added later should it prove possible to extract the wax from honey sold to Nairobi. If we assume an expenditure of the order of Sh 80,000 (salaries and travelling) then the excess of income over this (24,100) should be adequate to cover consumable stores and smaller items of expenditure. Thus if funds could be found for the capital investment in buildings and equipment the scheme should then be self-supporting. Any excess of income over expenditure (e.g. the Sh 96,000 possible from wax salvage) would be available for expansion of the project to new areas. This in turn would increase income further. Thus the growth potential of the scheme is satisfactory.

A profitable enterprise, with satisfactory reserves based in Teso, would be in a position to support the development of the industry in Kigezi. The Kigezi industry could then develop within an existing marketing framework, and the difficulties which would be involved in developing Kigezi first would be much less severe. It should also be possible to remove the disadvantages of the extra freight charges on shipments out of Kigezi by a system of equalisation of transport charges.

Ultimately it is envisaged that all suitable areas of Uganda could be developed for beekeeping. This would possibly require a period of fifteen years of intensive effort. During this period prices paid to producers should be carefully controlled to enable reserves to be accumulated out of which further development could be financed. Once this is achieved then prices should be raised to a level which would allow the beekeeping section to balance its books.

Eventually it should be possible to push the separation of honey and wax back to the producer either individually or cooperatively, thus enabling the staff of the section to concentrate on research into new methods, and the provision of maintenance extension services.

Conclusion:

It would appear that the Development of the Beekeeping Industry is not only feasible, but would be a highly profitable exercise, both in terms of foreign exchange earnings and savings on the national level, and the provision of a greater cash income to the rural population. Possibly the most important feature of all with respect to this programme is the fact that once started it should finance its own development.

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