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FOOD PRESERVATION PROBLEMS IN EAST AFRICA[1/]

by

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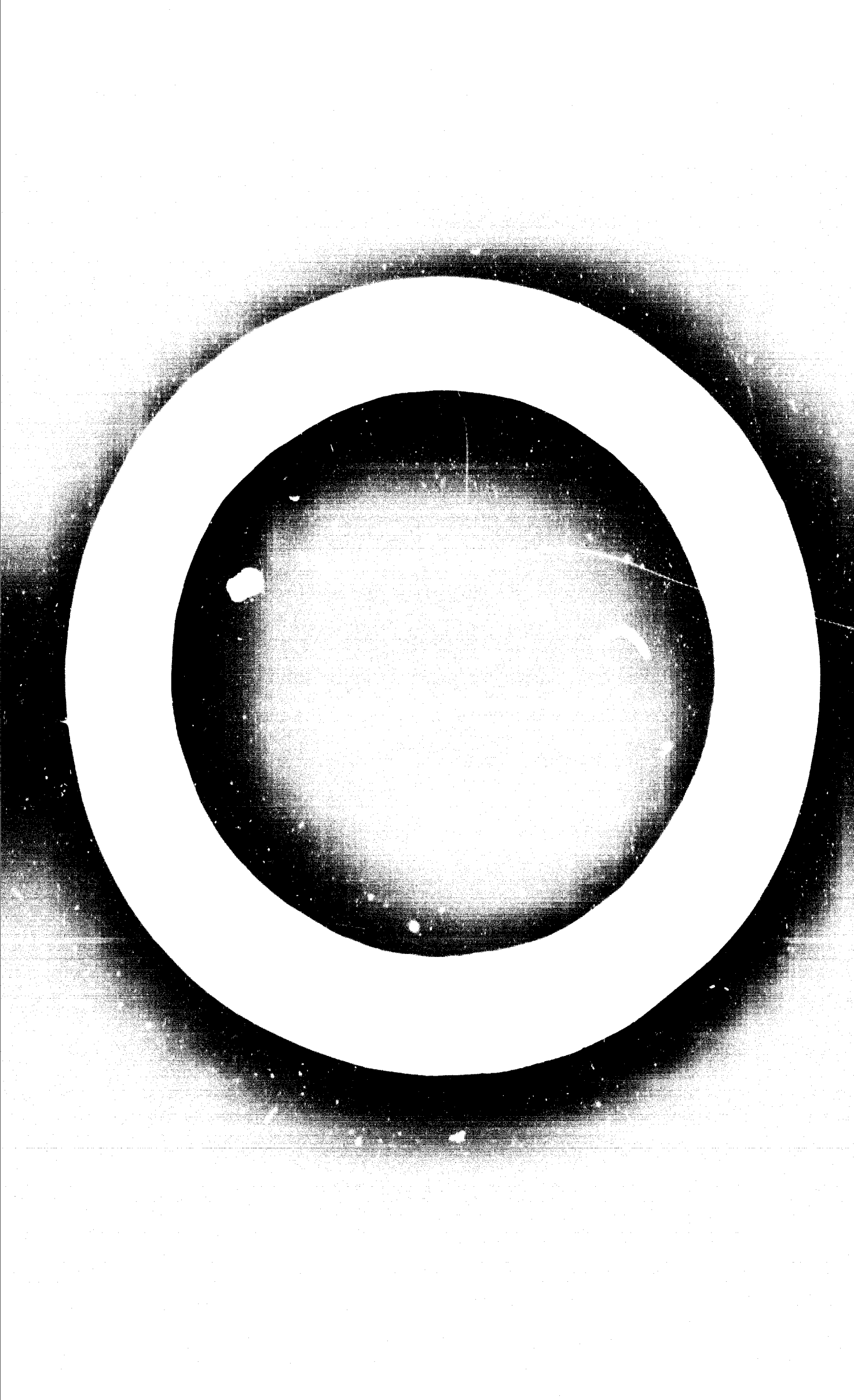

Speaking of food preservation problems in a region, we should first establish what kind of food items the region produces, what does it actually consume and how the nourishment habits are changing and will change in the future influenced by a more rational use of land and contacts with other peoples.

Developing countries must be contemplated dynamically. The fact alone that they are developing says, that there are significant changes underways, manifesting themselves less in the level of national income than in regard to the mode of living, social relations and economic orientation.

The history of East Africa is a history of incursions, with every invader bringing with him his own civilization and customs. The invaders penetrated the region along the then easiest penetration routes and established themselves in areas where they could subsist, leaving the less accessible areas more or less untouched and doing actually nothing to make of the region an economically viable whole.

This resulted in a division into a substratum of native population and a superimposed structure consisting of foreigners and a limited number of urbanized local population, each of the two groups leading an essentially different kind of life. The upper, economically established group of people lived, and still lives, on marketable supplies and imported goods, while the bulk of the native population continues to lead a subsistence economy, mostly unable to produce cash crops and to participate at the marketing in general. Nor is it capable to acquire technological means to improve either the production itself or the preservation of produce.

We are therefore confronted with two aspects of the problem, the one regarding the existing paying consumer and the other regarding the underfed cash-less population with its conservative feeding habits and agricultural technology, suffering of population explosion and having increasing opportunities to see the glittering commodities others are able to buy. This is the real problem to solve since it regards the majority of goods required to be consumed in the region.

Before going into details approaching the main topic of discussion, let us remind, that the native population in the region presently produces only such agricultural products which it can immediately consume or which

keeps well over the period where there is nothing else to eat. This means, that the present pattern of land-use in the region is dictated by reasons of survival rather than economic considerations. In the future, economically more convenient use of land will develop, producing cash crops and enhancing exchange of goods, leading to food preservation problems of another nature and a change in feeding habits.

Another factor influencing the feeding habits, and in consequence the pattern of agricultural production, is represented by inhibitions resulting from religious teachings. The region has been subjected in the past to religious rules imposed by numerous invaders of different creeds, the ones cumulating their prohibitions over the previous ones thus creating the probably most restricted bill of fare in the world. This reflects itself in the unbelievably great number of fasting days in some areas, and in a very low consumption of meat, eggs, milk and fish in some other areas. This all will change and is already changing. How far the changes will go can be only guessed. Chances are, that definite natural factors prevailing in the region will play a decisive role at it.

Of the several natural factors influencing past and future developments, the most important ones will persist to be the climatology, hydrology, morphology and pedology of the region. Local usage puts mostly climatology first classifying the region generally into three zones i.e. the cold zone, the temperate zone and the hot zone.

The classification is actually not covering all the climatological varieties occurring in the region since there are also a tropic rain zone a desert zone, and some other existing. Anyway, considering the zones as areas of possible agricultural development, the three main climatological zones can well serve the purpose of general subdivision into areas manifesting specific trends of development.

The most densely populated cold zone extends over altitudes (above sea level) of say 1,600 metres upward, with agriculturally exploitable areas extending up to some 3,500 metres and more. Beyond 2,600 metres there are mostly only pastures and forests prevailing. The zone between 1,600 and 2,600 metres can be said to display a very limited dimpason of temperature, which generally moves within +6 and +26°C with short periods of morning

frosts, when it drops to zero and slightly beneath, and still shorter periods of higher noon temperatures when they attain some 28°C.

The cold zone is characterized by uneven distribution of rainfall over the year. The rainfall attains 1,200 mm.p.a. on the average, most of it concentrated in the two periods of small rains and heavy rains.

Between the rainy periods, the day-time humidity averages between 40 and 50% with night-time relative humidity nearing the saturation point. During the rains, humidity changes very quickly and a couple of hours might sometime suffice to dry up the soil after rainfall.

The soil in the uplands is generally poor, due to its mostly volcanic origin, strong erosion and use of dung as fuel. The effects of erosion are best seen in the fact, that all rivers of any significance, are running in deeply eroded riverbeds and canyons reaching a depth of up to 800 metres and more.

Another characteristic of the uplands is, quite naturally besides, but often not thought of the low barometric pressure and in consequence a very low content on oxygen (by weight) in one cubic metre of air. The low density of air changes essentially the proportion of heat transmitted by radiation against that transmitted by convection, so that heating and cooling apparatus will behave differently than elsewhere. On the other hand, lesser oxygen content influences all oxygenation processes from fuel burning to the oxygenation of edible fats and the microbiology of the environment. This causes considerable differences at the contemplation of food preservation. Commodities keeping well under other conditions will quickly deteriorate under these and vice versa. More intensive evaporation and reduced boiling point are also not to be left out of consideration.

As to agricultural activities in the cold zone, it must be said that all plants not requiring low temperatures to hybernate on the one hand, and not requiring prolonged insolation (much sunshine) to mature can be grown there. The two conditions practically exclude all kernel fruit and mostly all of subtropical and tropical plants with the exception of isolated well protected spots occasionally naturally heated by thermal waters where bananas, citrus fruit and even coffee would grow. In other microlocationally well suited areas in the lower uplands there can be even mango, pineapple sugarcane and

avocado found, but all that doesn't amount to much where the uplands are concerned.

The over-all agricultural activity in the uplands remains reduced to grain crops, oilseeds, vegetables and grazing grounds, these latter mostly overgrazed.

The conditions in the uplands are such that due to relatively low quantity of sunshine, difficult hydrological conditions, occurrence of frosts and occasional heavy humidity, not more than one crop a year could be attained with the exception of vegetables which are mostly available round the year. As to livestock lack of food storage and unintroduced use of artificial feed compounds leads to overgrazing during the dry weather periods so that not less than 4 to 5 hectares of grazing grounds are necessary to keep one cow up. Cattle are generally small and take a long time to put on weight so that not more than 10% of the stand can be annually slaughtered. The yield on milk is extremely low and the milk is very fat. Local population uses it mostly for butter making. Sheep and goats are abundant but small and having hair-like wool. Their milk is also used for butter making. Conspicuous is the absence of local cheese. Only small quantities of cottage cheese are produced and fermented cheese is generally not known to exist as an indigenous product. Pigs are not being kept because of religious reasons so that there remain only chickens as quickbreeding suppliers of meat.

Except in isolated spots, the uplands are yielding no fruit at all and sugar appeared only recently in those areas. Honey was practically the only sweetening agent but serving mostly for fermented drinks.

Food preservation techniques in the uplands is limited to the preservation of grain. No preservation of vegetables and fruit is known traditionally to exist. Butter and oil are generally keeping well due to the low rate of oxygenation meat is kept alive and vegetable are available round the year.

Still, food preservation problems do exist in the uplands and the death toll due to food shortage is high. There are however two major causes for food shortage and they are (i) lack of money and (ii) lack of passable roads withstanding the rains. Lack of cash prevents people to stockpile foods and lack of roads, passable during the rains maker it impossible to forward food to the spots where it is badly needed.

The case is, that the peasant often sells his crops as soon as he harvests them at a generally very low price, being compelled to start paying exceedingly high prices when his own stocks run low. In the case of an unusually prolonged rainy period both lack of cash and impassable roads will cause calamity.

What changes can be expected in the future? For the uplands, the future seems to be in an improved livestock breeding, introduction of compound feeds based mostly on oilseeds and the development of meat and dairy industries. Nothing could be said yet about fruit. Strawberries are known to thrive well in the uplands and vine too but scarcely anything else. With the time, fruit varieties may be found fitting in the climate pattern but much experimentation must be done first. As to vegetables, asparagus, artichoke, cauliflower and harricot beans might have a good future as industrial raw materials and preservation of cabbage, cucumber and peppers by sowing, under simultaneous popularization of vinegar production and use should also be introduced.

As to grain and pulses, this is, as said before, more of a financial than technical problem. Adequate storage facilities, including protection against vermin and wastage should be provided for but the main problem will remain to exist, unless people will learn how to increase their cash returns.

The <u>temperate zone</u> is characterized by altitudes of say, 800 to 1,200 metres and up to 1,600 metres, but in the East African scenery altitudes between 1,200 and 1,600 metres will be more often than not found to be rather steep, as is the case all along the escarpments of the African Rift Valley.

In the temperate zone, rainfall is much less than in the cold zone, and amounts to an average 500 mm. The temperature runs up to some 38°C but there are all the same frosts occurring in some places. Low rainfall having periods of drought and poor pastures as consequence must be made responsible for the nomadic way of life peoples used to lead and are still leading in some parts of this zone. Nomadic peoples are driving their cattle along established routes dwelling during the rains in more arid areas and during the drought approaching the sometimes swampy banks of perennial rivers.

Soils in the temperate zone are very much varying as to their suitability for agricultural purposes. In places they are good or moderately good alluvial soils, in other places they are overflown by lava and volcanic detritus. In

some places they are outright rocky with only a thin layer of humus overburden and those are the places where swamps are expected to form during the rains.

Nevertheless, the good soil areas are not so few and they are usually very well suitable for cultivation particularly if still not far from permanent water flows where these latter are not too much below the level of lands. In places, even irrigation by gravity is feasible.

Such lands are nowadays getting turned into plantations and farms. Nomadic peoples are being given an opportunity to lead a sedentary life both as well farmers as well as farm hands. Plantations are invariably oriented towards high-yield crops in order to enable the owners and concessionaires to repay the investment. Most convenient in this regard are sugar cane, cotton, vegetables, citrus fruit, bananas and grape vine. Some areas not requiring high level of investments are suitable for ground nuts and occasionally for cereals.

Development of these lands will indubitably lead to a restriction of pastures and, unless artificial foeds are applied, to a reduction of livestock population in the zone.

The zone, where conditions allow, is well suited for the production of out-of season vegetables for marketing in Europe. Experience proves that several crops may be obtained in a year rotating sweet peppers, tomatoes, melons and other crops as is more convenient. Such practice requires cold storage and refrigerated shipping.

Almost any subtropical and tropical plant can be grown in the zone depending on the quality of soil in a plot and availability of water. Where water is abundant and the soil is good, and frosts not occurring it is simply the best one could wish. Still, crops must be selected according to the investment made at the conversion of the land and at the irrigation works. If these latter are connected with water storage plants, only a few crops will pay and almost not a singly one of the staple food kind. Anyway, the well viable crops will invite industrial conversion thus creating an opportunity for cash income for the population. Foods will have to be brought in from other parts of the land requiring artificial preservation in those areas, but this is a thing for the future.

Anyway the traditional nomadic ranching will disappear leaving still some areas fit for stabilized ranching. The temperate zone seems to suit imported breeds of cattle, which, by the help of compound feeds could well form a basis for meat and dairy industries. It seems, however, that the highlands are better suited for this purpose.

In the hot zone including lands at an altitutude between zero and the earlier mentioned 800 metres above sea level, the lands must be further subdivided into the coastal zone reaching some 50 kilometre inland, rocky deserts, salt plains and depressions and so on, which will leave only the valleys of some permanent and seasonal rivers habitable. This will reduce the altitude of cultivable parts of the zone to some 150 to 600 m.a.s.l., limited however to flooded or irrigable stretches along the riverbeds.

The coastal zone is practically no good for agricultural activities. The monsoon carries with it sea brine far inland and makes it too salty for cultivation. Palms, some grass, dwarfed acacia trees and some shrubs will grow there in spots. Rains, sometimes not a drop over the whole year, are unable to wash the salinity away, so that there is apparently nothing to be done. People are living on sheep, goats, fishing and mostly purchased durrah (sorghum millet). Meat is eaten on the same day as slaughtered (a religious regulation with Moslem population) and so is fish. No preservation of meat or fish whatever is practices traditionally which is easily understandable under the conditions. Infection of such commodities by insects makes drying impracticable if human consumption is considered. Wet salting is to my knowledge not practiced, at least not in the Red Sea area.

Fishing should however not be counted too much upon. The Red Sea is not so rich on fish as some people assume. There are no open water flows running into it which should account for it according to some theories. Most of the catch is landed from shallow coastal waters, and consists of various prime table fish, crabs, lobster, shrimps, inkfish and shells. Native population disposing of very primitive fishing tools and boats, keeps near to the coast. Off shore fishing produces sardines, mackerel, tuna, barracuda and shark in a great number of varieties and therefore not very well fit for industrial packaging. The Red Sea is considered to have a potential yield of 50,000 tons p.a. but the figure is not safe.

In the Gulf of Aden, fish periodically appear in great quantities and then disappears for a spell. Off-shore fishing blooms up and dwindles again but coastal population can anyway not make much out of it with its motorless boats. Coastal fishing, relatively rich because of low utilization suffices to cover the needs of the sparsely populated coastal zone.

To benefit of the opportunity people should be taught how to fish efficiently and how to preserve the catch. Customs should change and people should get accustomed to eat preserved fish.

The cultivable part of the hot zone is mainly represented by the earlier mentioned valleys of some permanent and non permanent rivers. Some of those valleys contain fine alluvial soils preserving subsurface water over the year and mostly flooded for several months in the year. The rainfall varies from 150 to 400 mm. less or more. In some of these areas people start cultivating the land as soon as the first rains soften the soil, tilling and sowing until the soil softens too much to be passable. Then the floods come and after the flood the crops subsist on subsurface water until they mature. In other cases, the soil is tilled after the floods as soon as it hardens enough and then, quick growing durrah, not requiring much water, is grown, the subsurface waters sufficing to bring the crops to maturity.

Upstreams, within the hot and damp, high banked canyons, fruit requiring much water is grown. These are the best banana groves and papaya orchards.

Flood control allows systematic irrigation without excessive investments. In places where the configuration of the grounds will allow it, large scale water storage and permanent irrigation would make excellent projects, providing for several crops in a year over large surfaces of naturally fertilized soil not requiring chemical fertilizer for several years.

The negative aspect of those areas is their exposure to pests. A persistent protection against various insects is required and the consumption of insecticides is great. Farmers must keep sometimes a dozen different insecticides in store to fight off specific insects. This, of course is not well possible for the small farmer to do on his own which reflects itself on the yield and quality of crops. Co-operatives and large scale planters can anyway master the situation well enough.

The commonly encountered cultures in those areas are cotton, ground nuts, sesame, durrah and tropical fruit. Some livestock is kept there too, mostly goats and cows, and of course, camels.

There we come to the problem of bananas. Besides being an important food item for local population, it is also a significant source of cash income. Considerable quantities of bananas are being exported to Europe, mostly subsidized by importing countries. The subsidy hangs as a Damocles' sword over the planters' heads, once the subsidy is withdrawn, the planters will go bankrupt. The great problem is what to do with bananas how to preserve or convert them industrially, or else, how to substitute them by other well paying and maybe safer crop. No satisfactory solution has been found so far and even preservation by drying didn't find its way into local habits although it could well serve as supplementary food of high nutritive value. Here again, the insects are maybe making open-air drying unsafe.

The fertile and irrigable part of the hot zone should be considered as the future mainstay of East African field crops production. It receives all the waters caught up in the uplands and all the results of their erosion. Riverbeds of drying-up rivers are serving as footpaths for cattle and deer during the dry-weather period and the first freshets at the start of the rains bring all the dung, thousands of tons of it, down onto the plane. If water is brought under control, millions of hectars of excellent lands will be possible to put under cultivation yielding crops upon crops.

The problem is, what to grow on those lands under the conditions. The fact is, that at the present, long-fibre cotton pays best and is actually the only crop justifying any moderate investment. Grain prices are generally so low and so unstable that in 1968 there were areas in the East African hot zone, where it didn't pay to harvest ripe durrah, because the harvesting alone cost more than could be obtained for it. Several months later some five hundred kilometres away from the place, people were suffering food shortage. Ground nuts are paying better, but still beneath the limits of profitability at moderate investments.

There is nevertheless a future in those areas, even if the population sticks to industrial crops. Cotton requires plenty of hands, and manpower must be fed even if food is imported. The hot climate of the zone asks for artificial preservation of stockpiled foods and stockpiled it must be because of reduced passability during the rains and floods.

Going now over to general problems of food preservation in East Africa, we must recognize, that the native population developed some methods of food preservation adapting itself physiologically and psychologically to the environment under the conditions of forced self-reliance and subsistence economy. Recent trends towards cash economy, industrialization and cultivation of industrial crops, are disturbing the age-old balance and are requiring a re-orientation in the mode of living, feeding habits and handling commodities.

General conditions in developing countries, having an undeveloped agricultural and mineral base are such, that these countries should be considered poor and resourceless. Any development in these countries will require considerable investments, which in their turn will tend to be oriented towards more lucrative industrial crops as well as items that may be exported at good price, leaving the staple food production at the level of subsistence economy or slightly better, and keeping the output of staple food beneath the rate of survival requirements.

It should be therefore expected, that food preservation problems will be connected at first with the trading of food items, rather than the preservation of foods raised and consumed in one same spot. This latter is going to take much more time since it involves the necessity of adaptation to changed way of living, very often conflicting with ingrained and deeply rooted customs.

As to the export of perishable foods, here as elsewhere an important place is taken by meat, fruit, vegetables and to a much lesser extent dairy products. In East Africa, distances separating most of the fertile areas from ports are unusually great. Foods are bound to cross mountains and valleys, be exposed to sudden changes of atmospheric pressure, humidity and temperature before arriving to their destination, which again is unavoidably a place with adverse climatic conditions.

Such conditions are favouring canning of those commodities, which makes both their conversion and marketing more onerous. Besides, fresh fruit and vegetables can't be canned, which leads to another kind of zoning. Most perishable commodities should be preferably grown and processed in areas not too far from the tide-water line and having a good access to a port. Even such areas will have to cope with overland transport distances of several

hundred kilometres. Cold storage on spot will be required, refrigerated transport and consequently good roads will be a must, and, finally, adequate cold storage facilities at the ports will have to exist. Their present availability leaves much to be desired, particularly at recently expanding ports. In view of such circumstances, even transportation by air is sometimes practiced, particularly in the direction of Gulf of Aden and Persian Gulf lands.

As to imported commodities, they are mostly brought over as canned and prepackaged with the exception of grain, which is imported in bulk and certain fruit which is packaged in wooden boxes. Fresh fish is taken inland by air, in insulated and iced containers.

In the cities, the affluent part of the population is currently using refrigerators and canned foods from other continents. Fashionable groceries are using nice refrigerated show-cases and deep-freeze rooms, selling occasionally overdue and non-refrigerated semi-preserves.

The native population, distrusting unknown food preservation methods sticks to its traditional fill of fare, falling prey to intestinal diseases, parasites and food shortage. Still, it survived so far but not for very much longer if nothing is done soon.