Kahere Poultry Farm School
Koliagbe, Kindia, Guinea

I. Introduction

This school is a small complex built between 1997 and 1998 on a poultry farm in Koliagbe near Kindia, a town 120 kilometres inland from the coast of Guinea. It was made possible by the support given to local initiatives by Eila Kivekäs and the development association she later founded, Indigo. The school was designed by the Finnish architects Heikkinen-Komonen who combined the timber structures typical of their own traditional architecture with local materials, improved by simple technological advances. It is the last of five projects designed by these architects for this client using a similar programme and materials.

II. Contextual Information

a. Historical background

In the early 1980s, Alpha Diallo, an agronomist, and Bachir Diallo, his uncle who is a vet, discussed the idea of creating a poultry farm because of the high levels of protein provided by chickens, a nutrient lacking in Guinea's diet. Both earned scholarships to study in Europe; Bachir went to France and then Italy; Alpha went to Hungary. There, Alpha developed an interest in the Finnish language, apparently because of its kinship to Hungarian, resulting in his translation of the Finnish epic poem *The Kalevala* into Fulani, the language of his ethnic group. This attracted the attention of the Finnish cultural elite and Alpha was invited to visit Finland. However, he was not fluent in modern spoken Finnish and so Eila Kivekäs, a wealthy, cultured woman who could speak French, became his translator and they became friends. In 1984, Alpha died suddenly in Finland. Eila arranged for his body to be sent back to Guinea to be buried in his home town, Mali, in the Futa Djalon mountains.

In 1984, Bachir, who was then in Canada, received a phone call from 'Madame Eila', as she became known: she proposed that he return to Guinea and initiate, with her support, the poultry improvement project that Alpha had told her about. The facilitation of private initiatives that went with a change of political regime in Guinea created favourable conditions for such undertakings. The poultry farm was started in 1986, in Koliagbe near Kindia, a town 120 kilometres inland from Conakry, and results were soon seen. In 1989, Eila founded a development association called Indigo, based in Mali town, which went into partnership with the poultry farm and eventually involved the collaboration of the Finnish Poultry Farmers Association. Indigo also promoted four building projects in the Mali area that combined alternative technologies and local materials with designs by Finnish architects.

One of the aims of the poultry farm was educational. Local farmers knew little about increasing production and improving the quality of the meat, preventing infestations and so on, and so the school began instructing groups of twenty to twenty-five people at a time. Later, the educational team on the farm defined five target groups: illiterate farmers, who received basic information on improving the quality of their chickens; farmers literate enough to receive more advanced information; students from professional schools, the intention

being to galvanize them to establish more poultry farms; professionals with an academic background such as veterinary studies; and university students working in fields related to food and agriculture, who came to prepare their theses or final reports.

Once trainees, students and researchers began to come regularly, the poultry farm's facilities could not easily accommodate them, so in 1997 Eila proposed to Bachir Diallo, director of the poultry farm, that amenities be provided near the main part of the farm. The project was designed by Haikkinen-Komonen, the Finnish architects who had already designed the projects carried out around Mali town. The school was completed in 1999, the year Eila died. It began operating in January 2000 and was officially opened in March 2001.

b. Local architectural character

The oldest form of dwelling, still common in the area and elsewhere in the country, consists of a round construction, made of raw earth-blocks, with a conical thatched roof. Such buildings are grouped in compounds and have three distinct types: larger structures used as a sleeping-cum-common room; smaller structures used for cooking; and covered areas without walls (known locally as a *baré bundi*) used for male socializing. These three forms are grouped around an open space, usually with a large tree in the centre, where all the household activities take place, such as the preparation of food, cooking and washing of clothes. A mat-walled enclosure, constructed on a spiral plan, may be found slightly offset as a latrine and for private ablutions. Quadrangular thatched constructions made along the same principles may coexist with round ones. Bamboo and wood-lath fences are also typical.

Close to urban areas, buildings proliferate with a rectangular plan, a hipped tin roof and a porch which may run around the house but is usually restricted to the whole or part of the front. This porch may be an extension of the roof slope or a separate lean-to section. In recent years, an 'American roof' has become popular, which consists of staggered pitch roofs. Simple joists between end walls can take the covering, with no need for trusses. This model is simpler and cheaper to erect and has become successful. A porch with two or more arches is typical.

Corrugated metal sheets (an alloy of aluminium and zinc, now produced in the country) rapidly became the preferred material for roofs, despite its deplorable insulation qualities. Concrete blocks are fairly common for construction, but the most usual material for walls in these houses is still earth-bricks fired in local kilns. The bricks (which are about 10 by 20 by 25 centimetres) are laid on the narrowest side and are frequently held together by a rudimentary concrete material; the walls are finished with concrete rendering. The climatic conditions within these buildings are poor, although improved with the introduction of ventilation holes in the space between the roof and the ceiling on the end walls, common in buildings with an 'American roof'.

The plan of these houses usually follows a simple scheme, with the common room opening directly onto the porch and sleeping rooms disposed on either side of a corridor that runs from the common room. Houses may be equipped with modern bathrooms with all the fixtures, even though running water is not guaranteed. There is often a round hut for the

kitchen, although the main activities of the household continue to take place in the tree-shaded yard in front of the house.

Fired bricks are produced using a similar method to that found elsewhere in the country. Blocks of earth, excavated nearby, are shaped using a wooden form, dried in the sun, and then arranged in cubical piles, several spaces being left at the bottom for burning wood; finally, they are sealed with mud and the fires lit. Two days after the wood has completely burned, the blocks are removed. Those which are not well baked are fired again. The quality of the finished material is not very good and the amount of fuel needed is considerable.

The buildings of the poultry farm itself were built using this technology. Their organization closely follows the traditional disposition, with a central space marked by the *baré bundi*.

c. *Climatic conditions*

This region marks the transition to the lower slopes of the Futa Djalon. The tropical climate is tempered by the proximity of the mountains, with maximum temperatures in the mid-30s (°C) in the hottest month, March, and a minimum temperature of 13°C in the coldest months (December and January). The rainy season comes between June and October, with the heaviest rains in July (up to 1,000 millimetres).

d. *Site context*

The farm is a couple of kilometres away from Guinea's main road connecting Conakry with Kindia and the inland region to the east.

e. *Site topography*

The school is on top of a slight elevation on the fairly flat grounds of the poultry farm complex. Vegetation is luxuriant with brush, palms and all kinds of fruit trees, especially mangoes.

III. Programme

a. *Objectives*

Eila's involvement with the project partly explains the thinking behind the programme. She was intent on creating an energy saving, climatically comfortable building model that would present a workable alternative to fired-brick walls and tin roofs, while encouraging the involvement of local craftsmen and exploring the potential of local materials for good design.

Her own background gave her a familiarity with architecture and architects; she had already commissioned Heikkinen-Komonen to work on projects promoted by Indigo since 1993. The principles applied successfully in these projects were to be applied at the Kahere Poultry Farm School: the utilization of local materials with improvements made possible by soft technology, in combination with structural ideas characteristic of the architects' native

traditions, adapted to the local craft conditions. For the architects, the main technical objective was 'to minimize brick making, transportation and the use of imported materials'.

b. Functional requirements

Functionally, three essential areas were required: a classroom, quarters for resident students (twelve at a time) and teachers' quarters. These were organized around a square which formed a courtyard, at the centre of which was a tree. Eventually, a kitchen was added, away from this main space.

IV. Description

a. Project data

The complex was set on the widest and highest part of a quasi-triangular fenced tract of land of 3,800 square metres. The buildings, occupying 340 square metres, are turned inwards onto a central square, reminiscent of the spatial organization of the traditional dwelling units scattered in the lands around the farm.

The structure and materials used had been tested in earlier projects. Thus, wooden porticoes were combined with stabilized earth-block walls and roof tiles made from a mixture of cement and glass or sisal fibre, as used in the Mali projects for a dispensary and Villa Eila.

Climatic comfort was to be ensured by the extension and positioning of shaded areas, by the very nature of the wall and roof materials, and by cross-ventilation through air circulation between the tiles and straw-mat ceilings and via the disposition of openings. The buildings were grouped so that unimpeded air flow was guaranteed. Stringent insulation requirements led to the use of double layers of blocks in the walls, producing a thickness of 30 centimetres which increased their bearing capacity and dispensed with the need for concrete reinforcement.

b. Evolution of design concepts

The geometric principles governing the design are essentially the same as those seen in earlier projects; that is, the dispensary and Villa Eila in Mali town and the Madina Koura school, where the classrooms also turn onto a central space. In the Kahere Poultry Farm School, the central space is marked by a grid based on a 1.2-metre module. The relationships between volumes in the project are set by the rules of this module. Functional considerations create volumetric and rhythmic variations, while the wooden structure that works independently of the walls is used to define sub-areas within the major divisions, as it is visible in the students' rooms where the study and the sleeping area are nominally divided by twin posts.

The roofs of the students' and teachers' quarters slope onto the central courtyard. That of the classroom slopes to the outside, extending on the courtyard side into a high porch, which is four modules deep and forms an apparently contradictory angle. This creates the major

spatial focus of the ensemble. The water tower marks the entrance to the interior square and formalizes the main access.

The openings are of different kinds. There are fixed-glass squares measuring 30 by 30 centimetres, regularly disposed in one row on the courtyard elevations and in two rows on the exterior elevations. Alternating with these are 160-by-90-centimetre windows with hinged window lights and fixed window guards; these narrow to 30 centimetres in the walls facing out of the teacher's sitting room and the office by the classroom.

There is a large surface with multiple fixed-glass panes high up on the front wall of the classroom block, a 210-by-210-centimetre glass door in the teachers' sitting room, and solid 210-by-90-centimetre wooden doors elsewhere. The 30-centimetre width of the smaller openings allowed them to be secured by brick bonding without the use of lintels. The rhythm and symmetry of the openings are major constituents of the composition of the elevations. The square is a recurrent form: the opening for the porches and large glass door are squares, as are the smallest openings, which form the vertices of virtual squares in the outward-facing elevations.

The surface finishes took into account the textures offered by local materials but, unlike the earlier projects, introduced bold areas of bright colour: the main elevation of the classroom is painted deep blue, the porches yellow.

The complex appears to perform well. The space is adequate for the present level of occupation and, according to the students, is comfortable, both in terms of climate and ambience. The sitting room was found to be better used as a small library, a change projected for the near future. The small kitchen in the teachers' quarters was never used as such as it was felt to be too small and closed in. It will be used as a storage space (which is needed), while a larger and well-ventilated kitchen has been designed and built on the periphery of the complex.

The treatment of outside spaces was basically limited to gravelling the courtyard and planting a fruit tree in the centre. Elsewhere, natural vegetation remained intact. A car park was recently provided halfway between the complex and the entrance gate, painted white curbs defining the spaces.

c. *Structure, materials, technology*

The building combines wooden structures – posts and rafters joggled and fastened by simple steel elements – with weight-bearing walls made from double stabilized earth-blocks. The wider span of the classroom is covered with the aid of simple metal trusses combined with the wooden beams. The tallest columns, those of the classroom porch, are each made of four posts held together by intermediate wooden blocks and steel bolts. Joggle junctions are used both for posts and beams, apparently to cut costs and because of a shortage of long pieces of hard wood.

The stabilized earth-blocks are made from a mixture of an appropriate earth and a small quantity of cement (3 to 5 per cent). At the optimum level of moisture, blocks of 15 by 15 by 30 centimetres are moulded in a hand press (the most efficient model is imported from Belgium). These are made one at a time, but a team of six people can produce between seven hundred and one thousand blocks a day. Their climatic performance as heat collectors and room-temperature stabilizers, which is dependent on mass, improves on that of raw earth-blocks. Experiments using stabilized earth-blocks in buildings had been supported by Belgian and French NGOs (non-governmental organizations), both in this region and in the highlands, and the results were convincing. It seemed likely that this material would compete favourably with fired bricks. Furthermore, fired-brick walls need to be rendered in concrete whereas stabilized blocks, which are hard and have a good finish, can be left exposed.

The blocks have been left exposed on the external faces of the walls, with the exception of the classroom elevation facing the courtyard, which is rendered and painted deep blue, and the entrance porches of the student quarters, which are rendered and painted bright yellow. Industrial glazed tiles are used in the washing and toilet areas. The interiors are all rendered and painted white or light cream. Concrete is used for the buildings' footing platforms. The porch floors are simply cemented while the interiors are paved with tiles made on site. The floor of the courtyard is laterite gravel. Ceilings are constructed of mats made of woven wood laths, commonly used locally for light partitions and fences. The roof tiles, made of a 3-millimetre thick mixture of cement with glass or vegetal (sisal) fibre, moulded on site, are uncoloured.

Water and electricity are provided by the farm's supply; water is pumped to the water tank from there. There is no telephone. Flush toilets are used; sewage is drained to a cesspool.

d. *Origins of technology, materials, labour force, professionals*

The Finnish architects introduced their wood-frame technology. Wood, hard *acajou* and softer *samba* for the structure and *iroko* for the doors, came from the Guinea forest and was bought in Conakry. Earth for the blocks and floor tiles was excavated nearby and moulded on site, the blocks on a hand press, the tiles on wood forms specially made by the site carpenter. Tiles were formed in metal moulds then submerged in water in tanks made for the purpose within the farm's main quarters. Cement, steel, glass and fibreglass were imported.

Labour force

All the labour was local; all the tools were manual.

Professionals

The head mason was from the region. He had begun his professional life with Senegalese contractors in Conakry and was contacted in 1986 by the farm's director to construct the farm buildings in fired brick. He later undertook training in the stabilized earth-block technique at Essor, a French NGO with headquarters in Pita near Labé, which had already trained the

masons for the projects in Mali town. The head carpenter was the same as at Mali, where he was trained when he first had contact with this type of structure.

Construction was overseen by a Finnish architect who spent two periods on site, first for the wall masonry and, towards the end of the project, for the carpentry; a Guinean engineer undertook the general supervision.

V. Construction Schedule and Costs

a. History of project

The project was commissioned in 1997 and the design completed in 1998. Construction began in 1998 and was completed 6 months later in 1999. Occupancy began in January 2000.

b. Total costs and main sources of financing

The total cost was 153,373,000 GNF or 104,000 USD, which brings the cost per square metre of built area to 306 USD.

c. Comparative costs

The cost of materials was higher than in the conventional fired-brick-tin-roof buildings. If the price of blocks is becoming closer to that of fired bricks, tiles still cost almost three times as much as corrugated metal sheeting, although they are less expensive than the best quality plate metal that has been introduced recently.

VI. Technical Assessment

a. Climatic performance

Climatically, the buildings perform well. The thickness of the walls and the ventilated ceilings keep room temperatures at comfortable levels during the hot season. Natural light is sufficient and controlled. Because of the large glass surface on top of the west wall, the classroom may get a bit too hot in the afternoon but classes being held in the morning do not seem to be affected. No direct account could be obtained on how the building performed during the rainy season. There is a distinct possibility that insects could come in through the cracks between the ceilings and walls when they swarm during this wet season.

b. Ageing and maintenance

There were already some infiltration marks on the walls where they intersect with the roof on the lower side, caused during the rainy season. This could be due to displaced tiles, hairline cracks or an inadequate roof pitch (25 per cent) to withstand the heavy rains. The most visible sign of wear, however, is the warping of elements of the wooden structure, especially in the roof. This may be due to the use of softer wood and to its being cut when it was too green and not dry enough.

VII. Users

a. Beneficiaries of the programme

Students and staff of the poultry-farm school.

b. Users' and professionals' response

The project met with a very favourable response. The students liked the appearance of the buildings and felt good inside; the temperature of the rooms was found to be so comfortable that they had never needed to open the glass windows, even on the hottest days. They were definitely won over to this type of building. The farm staff were happy with and proud of the complex; so were the workers. It was regretted that the farm's original buildings and even their own houses had not been made using these materials. A mosque was recently built in the central part of the farm complex by the head mason, adapting the techniques he had learned.

VIII. Persons Involved

Eila Kivekas, client and user, founder and director of Indigo (died in 1999; represented by her son, Antti Utriainen), from Finland
Bachir Diallo, director of the poultry farm, from Kindia

Heikkinen-Komonen Architects, designers, from Finland
Ville Venermo, architect, site manager, from Finland
Boubakar Barry, civil engineer, construction supervisor, from Conakry
Abdulhaye Djiby Sow, head mason, from Kindia
Suleymane Saouré, head carpenter, from Mali town
Moustapha Souaré, master tile maker, from Mali town

A local body of masons, carpenters and helpers.

Fernando Varanda
May 2001

Reference Articles

Diallo, Alioune, 'La première École Avicole s'ouvre à Koliagbé', *Horoya* no. 5595, 7 April 2001, Conakry.
Heikkinen, Mikko and Markku Komonen, 'Kehitysyhteistyota Guineassa/Development Cooperation in Guinea', *Arkkitehti* 4, 1998.
'Hedelmapuun pihapiiri Guineassa/A fruit-tree courtyard in Guinea', *Arkkitehti* 3, 2000.