

**COURSE CODE:** AGE 507  
**COURSE TITLE:** Farm Structures  
**CREDIT UNITS:** 3 Units  
**DURATION:** 3 HOURS/WEEK

### **COURSE DETAILS:**

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### **COURSE CONTENT:**

Farmstead planning and layout. Integrated study of farm housing – family housing, livestock housing, farm products and food storage structures. Environmental control and structural requirements of crops and livestock. Design of structural members of wood, steel, plain and reinforced concrete and local materials. Design of farm structures, columns, beams nailed and local bolted connections of timbers.

### **COURSE REQUIREMENT:**

This is a compulsory course for all 500 level Agricultural Engineering Students. AGE 409 is a pre-requisite for the course. Students are required to participate in all class activities and have a minimum of 75 % attendance to qualify for final examination.

### **READING LIST:**

1. Mijinyawa Y. (2002). Farm Structures. Aluelemhegbe Publishers, Ibadan. 129 pp.
2. Garrison P. (2005). Basic Structures for Engineers and Architects. Blackwell Publishing. 278 pp

### **LECTURE NOTES:**

#### **1.0 FARM STEAD PLANNING**

Planning is an important activity which determines the success of any endeavor. It is often said that “without plans, purposes are frustrated”.

Planning is the first and most important step in designing a farm stead. The cost of changing a plan on paper is very low when compared with an alteration to a completed building; also, an ill-conceived arrangement of buildings can diminish profits on a long term. At the planning stage, it beneficial to evaluate all necessary factors that must be considered and reasonable compromises made. For

example, the distance between each building in a farm stead is important, convenience and efficiency might indicate very close proximity, while fire safety may dictate a minimum distance of 30m. Offensive odours might inform distance of over 100m apart from dwellings. Careful planning with adequate information will help to attain desirable compromises.

### 1.1 SITE SELECTION

A number of factors necessary for consideration for site selection for a farm stead are outlined below:

- (A) **Drainage:** - Adequate surface and sub-surface drainage will ensure that foundations of structures are dry and will prevent local flooding. Well drained soil is necessary for the operation of Septic tank and for the removal of feed lot runoff and other wastes.
- (B) **Waste Management:** - The ability to handle waste without problems is very important. This is particularly so if the farmstead will house a major livestock enterprise. The site must conform to all state and local environmental regulations; the topography must be satisfactory for the required storage and drainage of manure and other effluents; prevailing wind direction is required to prevent pollution or dust from mills etc.
- (C) **Water:** - Availability of good quality of water for the farm is very important, almost all activities on the farm require water and it must be available in adequate quantity.
- (D) **Utilities and Services:** - These include telephone, electrical services, school bus, product delivery and pick up, access drives etc. The soil should be well drained and rich enough to provide landscaping gardens, play areas etc.
- (E) **Orientation:** - Air drainage and maximum sunshine may require orientation on a gentle southerly slope. Prevailing winds must be considered and natural barriers used where possible.
- (F) **Expansion:** - Adequate provision for future expansion must be provided for. Growth in this farm stead enterprises should be anticipated and the layout should facilitate expansion of buildings and services. It is pertinent to also provide for expansion of all facilities such as machineries, utilities etc. It is wise to look for twice as much area as that required initially, because of the impact of increasing production volume in future

## **1.2 BUILDING ARRANGEMENT**

The arrangement of facilities for maximum efficiency of operation should be a prime concern. Proper arrangement increases efficiency by reducing walking distance to a minimum and providing adequate drive ways and turn around. It is important to note that fire protection, safety and security and all influenced by the farmstead planning.

When a site has been selected, it is then needful to draw a map which will show major details. There should be contour lines, the direction of the north, direction of prevailing wind and general slopes, existing roads, natural wind barriers and water ways. The arrangement and rearrangement of buildings should then follow till a satisfactory layout is designed. An operation center should be located first, this will often be the farm house; the farm house should be sited such that it can be accessed from any direction in the farm stead, in general cases, it should be centrally located since the entire farm is administered from the farm house. The remaining buildings can then be arranged in relation to the operating center.

Building arrangement requires the consideration of some environmental factors such as slope, prevailing wind, sun etc. buildings should be located on relatively high ground with surface drainage directed away from foundations. Buildings should be arranged to take advantage of natural conditions; winds can blow in all direction but the prevailing direction is important, winds carry odours, dust, and noise, proper arrangement of buildings will use the wind to carry these away from the living center. Livestock yards and buildings should be located down wind (wind ward) from farm home and from neighbours. Buildings lined up at right angles to the wind rather than parallel are less subject to the spread of fire. Also, open front buildings, stockyards and solar heated facilities should be arranged so that during cold season they receive the full benefit of sunlight. Tall buildings, such as tower Silos, should be located so they do not cast shadow on feed lots.

Labour efficiency is improved by reducing travel to a minimum; buildings which will require frequent movement of workers should be sited close. Arrange buildings in relation to drive and yard to allow easy maneuvering of large vehicles and equipment

## **1.3 PLANNING OF FARM BUILDINGS**

Farm buildings represent a production or storage cost. Every enterprise requires a return on every investment made hence a return on feed and labour cost is expected. In view of this, a benefit from a building investment should also be anticipated. Some of the benefits derivable from a farm building include: -

- Provide facilities for efficient operations
- An environment providing conducive and sanitary conditions.
- Provide desirable condition suitable for production
- Provide comfortable surroundings for both livestock and workers.
- Provide safe conditions for both livestock and workers.

It should be noted that a number of design factors must be considered in planning a building to obtain the greatest number of benefits at a reasonable cost, some of these factors includes:

1. The functional requirement for the enterprise such as space, temperature, light, safety, sanitation, physical protection etc.
2. Efficiency of system, including centralized operation, bulk material handling etc.
3. Adequate structural design for the loads to which the building will be subjected to.
4. Suitability of materials with respect to characteristics like durability, cost, fire resistance, ease of cleaning etc.
5. Economy of construction, costs are reduced by choosing prefabricated assemblies, standard size materials and components etc.
6. Flexibility of design that will allow proposed enterprise to be altered or a new enterprise to be established with minimum expense and effort.

## 2.0 DESIGN OF FARM STRUCTURES

Farm structures are different from urban structures, mainly due to the nature of load they carry and the purpose for their use. These two factors and others are very important for consideration in any design of farm buildings.

### 2.10 LOAD CONSIDERATION FOR BUILDINGS

Every building must be designed with adequate strength characteristics, the load to which it will be subjected must be determined. It is pertinent for the engineer to understand the nature and significance of the various types of loads that act on farm buildings and then relate this information to all decisions on design, materials and construction methods.