SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF AGRICULTURAL ENGINEERING

19AGE307-ERGONOMICS OF FARM IMPLEMENTS AND MACHINERY

UNIT II-ANTHROPOMETRY

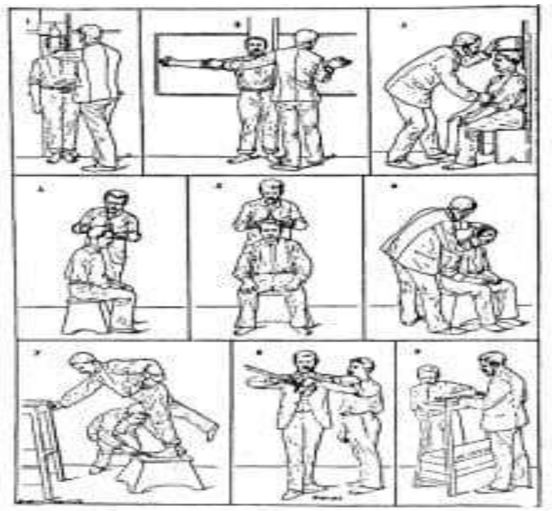
TOPIC: DATA COLLECTION AND MEASURING TOOLS

HUMAN MACHINE

- 206 bones → lever systems → smooth cartilage at the joints → minimizes friction
- Muscles → produce the forces
- Physical work - muscle power (energy) and skeletal tissues
- Muscular system → approximately 40-45% and 25-35% of total body weight of man and woman, respectively

FATHER OF ANTHROPOMETRY

Alphonse Bertillon is credited as the father of anthropometrics based on his classification system known as the “anthropometric system” or “judicial anthropometry”.



BODY DIMENSIONS AND STRENGTH PARAMETERS USEFUL IN FARM EQUIPMENT DESIGN

a. 79 body dimensions and 16 strength parameters were identified for inclusion in the survey.

b. Due attention was also given to ISO standard 7250 (1996) (Basic human body measurements for technological design)

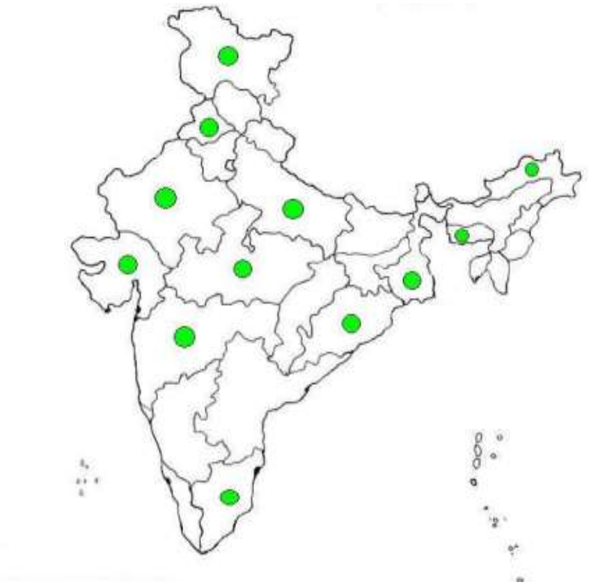
c. Recommendations of the conference on Standardization of Anthropometric Techniques and Terminologies (Hertzberg, 1966).

d. Standard terminologies as given in the Anthropometric Source Book (NASA, 1978) were used.

DATA COLLECTION

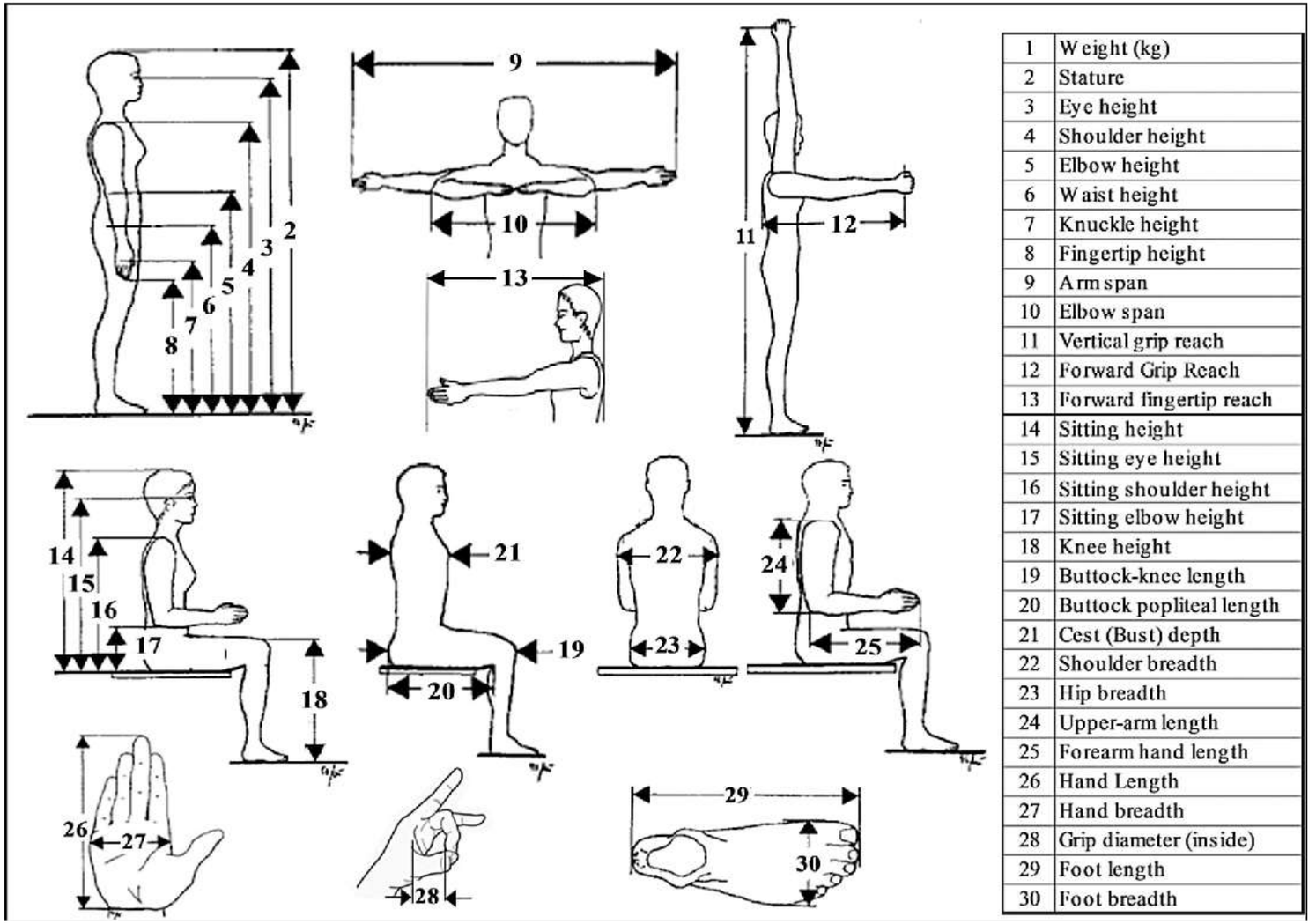
- Data on 79 body dimensions for 14,618 agricultural workers (8970 male and 5648 female) from 15 states were collected

- Strength data on 16 parameters for 9515 workers (5570 male and 3945 female) were collected.



MEASUREMENT OF BODY DIMENSIONS

Pictorial representation of body dimensions useful in agricultural equipment design



1	Weight (kg)
2	Stature
3	Eye height
4	Shoulder height
5	Elbow height
6	Waist height
7	Knuckle height
8	Fingertip height
9	Arm span
10	Elbow span
11	Vertical grip reach
12	Forward Grip Reach
13	Forward fingertip reach
14	Sitting height
15	Sitting eye height
16	Sitting shoulder height
17	Sitting elbow height
18	Knee height
19	Buttock-knee length
20	Buttock popliteal length
21	Cest (Bust) depth
22	Shoulder breadth
23	Hip breadth
24	Upper-arm length
25	Forearm hand length
26	Hand Length
27	Hand breadth
28	Grip diameter (inside)
29	Foot length
30	Foot breadth

ANTHROPOMETRIC TOOLS

To obtain anthropometric measurements, a variety of specialized tools (as depicted below) are used:

Stadiometers : height

Anthropometers: length and circumference of body segments

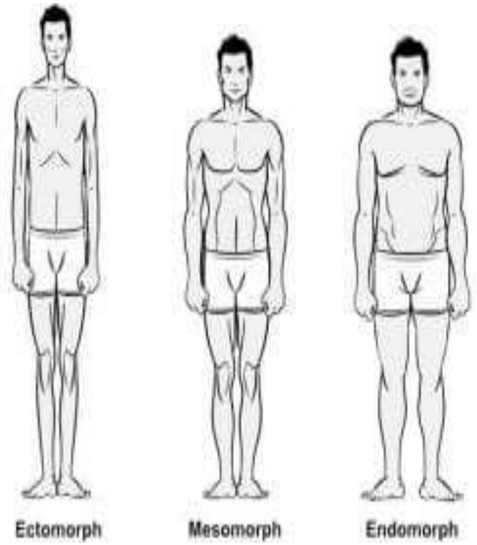
Biocondylar calipers: bone diameter

Skinfold calipers : skin thickness and subcutaneous fat

Scales : weight

ANTHROPOMETRIC SOMATOTYPES

Three main somatotypes as illustrated below (endomorph, ectomorph, and mesomorph), although some individuals may represent a hybrid of two somatotypes.



HEATH-CARTER ANTHROPOMETRIC SOMATOTYPE

Size measurements involve:

a. Head height, length, and width
b. Head Shape
c. Sitting and standing height (provides an indication of the trunk height and lower limb relationship)
d. Androgyny index (relative width of the shoulder and pelvis; typically a good indicator of sexual dimorphism after puberty)

Structural measurement include: Height, Weight , Body mass index

Human composition measurements are based on the fact that the human body is composed of:
Fat ,Muscle ,Bone , Connective tissue , Nervous tissue (e.g., the brain) , Organs (e.g., heart, liver, etc.) ,Skin

MEASURING INSTRUMENTS

- For measurement of body dimensions
  - ➢ Harpenden Anthropometric Equipment
  - ➢ Siber Hegner Anthopometer with accessories
  - ➢ Integrated Composite Anthropometer developed at IIT, Kharagpur
- For measurement of strength parameters
  - ➢ CIAE strength measurement set-up and electronic timer
  - ➢ Novatech load cells and load meter

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Thank You