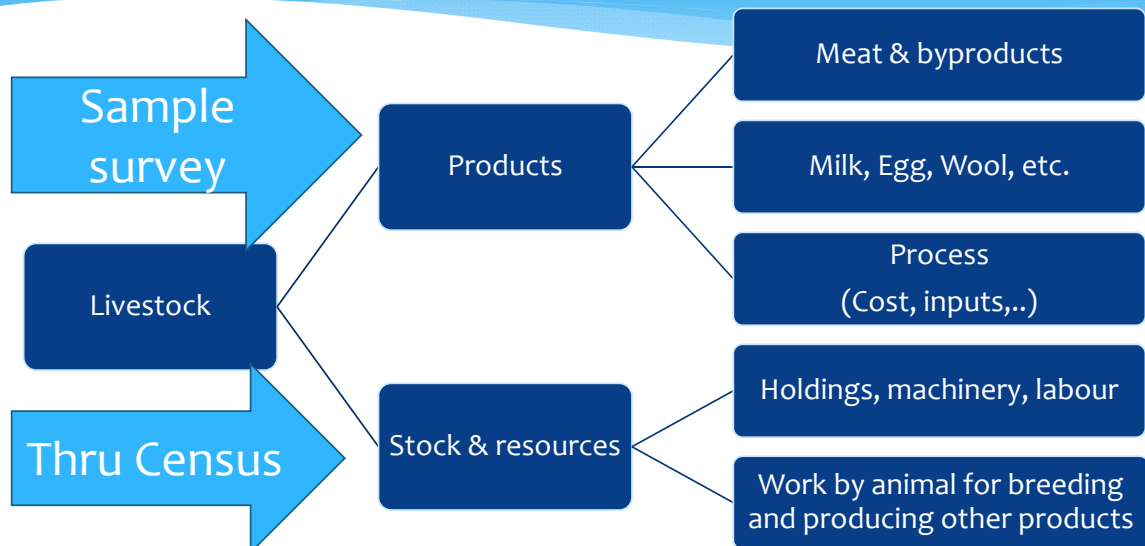**Second Regional Training Course on Sampling Methods for Producing Core Data Items for Agricultural and Rural Statistics**

Module 5:   Sampling Methods for Livestock Surveys

Session 5.2: Sampling methods for livestock surveys

9 – 20 November 2015,
Jakarta, Indonesia

UNITED NATIONS
SIAP
Statistical Institute for
Asia and the Pacific

IMPROVING AGRICULTURAL STATISTICS
Global Strategy

BPS, Statistics Indonesia

Data on livestock

Sample survey

Thru Census

Livestock

Products

Stock & resources

Meat & byproducts

Milk, Egg, Wool, etc.

Process
(Cost, inputs,..)

Holdings, machinery, labour

Work by animal for breeding and producing other products

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Sampling designs for livestock surveys

✓Normally a **variation** of *stratified multi-stage random sampling* is adopted

Depending on ….

✓Frame available (units &variables)

✓Estimates required

✓Level of disaggregation demanded

✓**Stratification:**

✓Geographical: *(sub)District, Province,..*

✓Geographical * livestock variables: *district*sheep producing (0,1), province*livestock unit, ..*

✓**Clustering:**

✓Village/town (with livestock activities at census night)

✓Block/segment

✓Group of households (2nd stage)

Sampling designs for livestock surveys

✓**2ⁿᵈ&3ʳᵈ stage sampling units:**
- ✓Households (with livestock activities)
- ✓Livestock holdings/holders/slaughter house (*distribute sample across products, **say milk, egg, meat, wool***)
- ✓Animals (distribute sample size across **"products*type"** of animal)

✓**Selection method:**
- ✓PPS (if measure of size available; **# of holdings/households, livestock unit/number**)
- ✓SRSWOR/SYS
- ✓Full enumeration

Sampling designs for livestock surveys

✓**Sample size allocation:**
- ✓Proportional to number of
  - ✓***Holdings/holders***
  - ✓***Livestock***
  - ✓***households***
- ✓Neyman/optimum
  - ✓***Obtaining information on variance/cost/correlation from last surveys***

A real scenario; Country A

✓**Survey objectives:** Produce statistics on livestock activities at province level

  ✓Parameters: total number of (holdings, holders, sheep, goat, cow, buffalo, camel, milch cow), total production of milk, total employees, total feeding (by type)

✓**Target population:** total *active holdings* in the country

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A real scenario; Country A

✓**Sampling Frame**: Obtained from latest agriculture census (conducted five years ago):

  ✓ *First stage:* list of all villages and towns with livestock activities at census night

  ✓ *Second stage*:

Urban	Rural
• All holdings *active at census night*	• All holdings *active at survey reference time* • Obtained from listing

A real scenario; Country A

✓ **Sampling design**: Two stage stratified sampling

    ✓ *First stage:* villages/towns stratified in each province based on ***livestock unit (LU)*** at census night. Then selected with *SRSWOR*.

        LU=sheep+0.8*(goat)+7.28*(buffalo)+6.29*(cow)+6*(camel)

    ✓ *second stage*: holdings are further stratified in two groups; ***large & Small***

| Large holding | • More than 120 sheep/goat; OR • More than 20 cow/buffalo/camel |

A real scenario; Country A

✓ *second stage*: holdings are further stratified in two groups; ***large & Small***

✓ ***All large holdings*** are surveyed in selected PSU

✓ ***Small holdings:*** SRSWOR in selected towns and Systematic in selected villages

A real scenario; Country A

✓ *Sample size at the first stage in each province:*

$$n = \frac{(\sum_{h=1}^{H} N_h S_h)^2}{(rY)^2 + \sum_{h=1}^{H} N_h S^2{}_h}$$

> *n* is allocated to strata by using Neyman allocation method

✓ *r*= maximum relative error of total LU in province

✓ Y= total UL S_h=standard deviation of LU variable in stratum *h*

✓ N_h=number of PSUs in stratum *h*

A real scenario; Country A

✓ *Sample size allocation to strata:*

$$n_h = n \times \frac{N_h S_h}{\sum_{h=1}^{H} N_h S_h}$$

✓ **Expected sample size at 2nd stage:** $m = M^L + m^s$

▪ M^L: Expected number of large holdings in selected PSUs *(full enumeration)*

▪ m^s: Expected sample size for small holdings

A real scenario; Country A

✓ *Allocation of sample size at 2ⁿᵈ stage:*

$$m_h^s = m^s \frac{M_h^s S_h'}{\sum_{h=1}^{H} M_h^s S_h'}$$

✓ S_h' = standard deviation of *LU* among small units in stratum *h*

A different scenario

✓ **Survey objectives:** estimation of major livestock products; milk, eggs, wool and meat

✓ **Approach:** integrated approach for simultaneous estimation of all these products in a single survey *(sample spread over 3 seasons)*

✓ **Design:** three-stage stratified random sampling

| Village | HH cluster | Animal (except layers) |

A different scenario

✓**Sampling at 2ⁿᵈ stage:** SRSWOR

Example:

* Milk: 4 clusters of 2 households each
* Eggs: 4 clusters of 5 households each
* Wool: Sample of 8 households (Flocks)
* Meat: 2 recognized slaughter houses

A different scenario

✓**Sampling at 3ʳᵈ stage:** SRSWOR

Example:

* Milk: Two cows and/or buffalos in milk and all goats in milk
* Eggs: All the laying birds
* Wool: Two rams, two ewes, two lambs
* Meat: Three sheep, three goats, three pigs