Making of planted area of minor crops by using ALIS

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This study report is written for a working level statistician who responses on conducting an area sample survey by ALIS in order to respond a request he or she should make the planted area of minor crops by using ALIS. However, we have to recognize that it is difficult to estimate the planted area of minor crops by simple sampling method. And we need to give some ingenious attempt to clear this problem.

1. Preface

Until here, I instructed about a statistical sampling theory based on a result of estimated agricultural land area. Fundamentally speaking, ALIS itself is designed mainly for an agricultural land area estimation. Because I considered that the agricultural land area is the most basic data on production statistics data and others data like crop planted area or crop production are made based on a result of agricultural land area.

However, the countries which it has been implementing ALIS feasibility study have offered a strong interesting for the result of minor crops planted area. This interesting show that these countries did not have a proper making method for minor crops planted area until now. So I refer about the property of an estimated crop planted area in ALIS feasibility study and instruct a proper making method on minor crops planted area by using ALIS function in this report.

2. Estimated data condition of crop planted area

First, let check the result of feasibility study in each province. The below charts show a number of second sample and a number of appearance sample of each crop, an appearance rate, an estimated area and a result of verification by each crop.

Feasibility study	Number of second sample	Crop	Number of appearance sample	Appearance rate (%)	Estimated area (ha)	$\bar{x}$ (a)	σ (a)	SE (a)	SE rate (%)
Khammouane province, Laos PDR.	169	Rice	36	21	13,163.37	71.89	185.38	14.13	19.66
		Maize	14	8	332.22	1.81	8.71	0.67	36.85
		Sugarcane	2	1	239.05	1.31	16.24	1.24	94.66
		Soybean	-	-	0.00	-	-	-	-
		Cassava	13	8	448.47	2.45	14.56	1.11	45.3

Feasibility study	Number of second sample	Crop	Number of appearance sample	Appearance rate (%)	Estimated area (ha)	$\bar{x}$ (a)	σ (a)	SE (a)	SE rate (%)
Kandal province, Cambodia.	173	Rice	165	95	109,602.89	811.33	299.05	22.60	2.79
		Maize	12	7	5,156.32	38.17	152.48	11.52	30.18
		Sugarcane	6	3	1,385.56	10.26	69.62	5.29	51.56
		Soybean	1	1	466.97	-	-	-	-
		Cassava	1	1	50.19	-	-	-	-

Feasibility study	Number of second sample	Crop	Number of appearance sample	Appearance rate (%)	Estimated area (ha)	$\bar{x}$ (a)	σ (a)	SE (a)	SE rate (%)
Nueva Ecija province, Philippines.	200	Rice	184	92	176,445.92	738.24	412.50	29.05	3.94
		Maize	4	2	333.57	1.40	13.38	0.94	67.14
		Sugarcane	-	-	-	-	-	-	-
		Soybean	-	-	-	-	-	-	-
		Cassava	4	2	573.95	2.40	25.46	1.80	75.0

As you study, a standard error and a standard error rate show a confidential interval of the estimated data as the data accuracy. Generally, we can recognize that a less 5% SER data as a reliable data. As you understand well with checking the result of feasibility study, we have to recognize that it is difficult to estimate the planted area of minor crops by sampling method.

For example like figure 1, if you want to target 5% of the standard error rate for the estimation data, in case of Maize of Kahammouane province Lao PDR, we need to extract 9,364 samples as the second sample. Generally considering, it is an impossible sample figure. And we have to recognize, this result apply to others sampling method like interview survey by using a list frame not only ALIS.

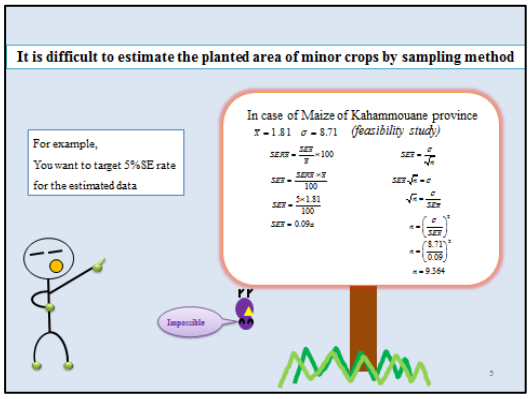

Figure 1

3. Distribution method

However, we have an area estimation tool named ALIS, it would be a waste not to use ALIS function for the area estimation of minor crops planted area. So I suggest two methods to estimate the planted area of minor crop with keeping data accuracy by using ALIS function.

One is the distribution method. Let's recall, *the accuracy is mostly not affected by framework size*.

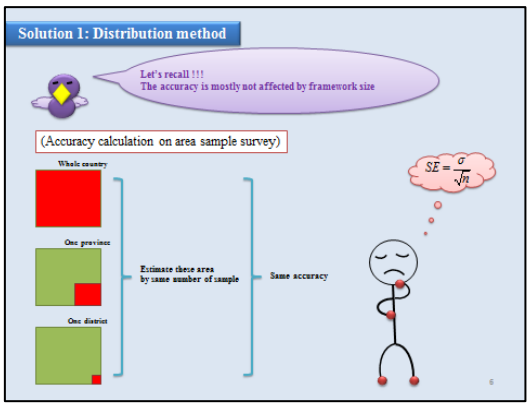

Figure 2

In fact, the accuracy is mostly affected by the number of sample. Therefore, if you could implement ALIS for all provinces, you might get many sample data of minor crops as the data of whole country.

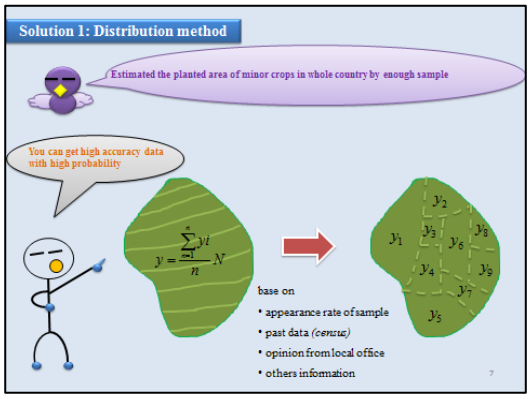

Figure 3

In fact, you can estimate the planted area of minor crops in whole country with enough number of samples. The estimated area data becomes the high accuracy data than estimated data by province surely.

After that the planted area which it estimated as a whole country's data is distributed to each province according to some indications like appearance rate of sample, past data like census and opinion from local office.

However, you have to pay attention for the method of data publication. You need to clear the survey method and estimation method for data user like "*The total area estimated by xxx samples which implemented field survey. SE=xx.x, SER=xx%. The province area data is estimated by distribution method with information collection and …*"

4. Ratio estimation method

Ratio estimation method uses a ratio estimation formula to estimate the crop planted area by seeking the change rate of this year's area and last year's area in the same sample. You can get high accuracy data by small sample.

$$Y = \frac{\sum_{i=1}^{n} x_i}{\sum_{i=1}^{n} y_i} y$$

y= total crop planted area of last year

yi= planted area in "i" number sample of last year

xi= planted area in "i" number sample of this year

However, you have to set a basement area "y" by each crop. We can consider this "y", census data, simple estimation data; but it needs many samples and reporting data as a candidate data. Anyway, it's requested considerable reliability.

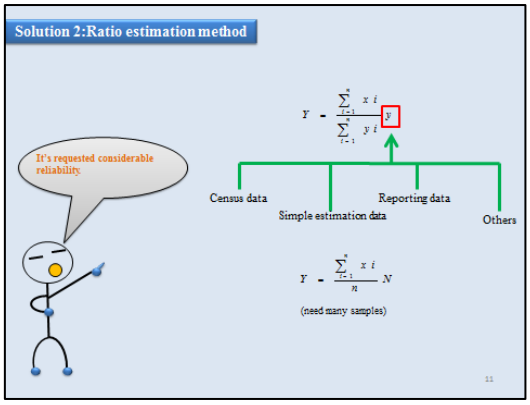

Figure 4

Figure 5 shows the specific work flow in case of using "Ratio estimation method".

- First, it decides the basement area "y".
- And sample area meshes are decided from second samples in ALIS. It is preferred that these sample meshes would be fixed for 5-10 years.
- And it conducts the field survey for these decided sample meshes. And then it measures the crop planted area by ALIS
- Finally, it calculates this year's area "y'" by ratio estimation formula. Of course this "y'" becomes next year's "y".

You repeat this operation every year.

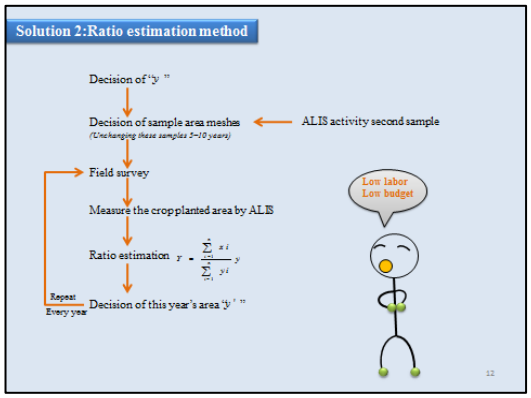

Figure 5

5. Conclusion

However, in general speaking, there is no a decisive method for the estimation of minor crop planted area by sampling method. Personally, I think that a combination of the reporting and the ratio estimation method become the most proper method for minor crops. At least we should not take many samples for this task.