The consideration for making of area framework in ALIS

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ALIS[note] is a comprehensive supporting system for area sample survey which conducts consistently from making framework to adding framework information, selecting sample and estimating area. In this clause, I show the basic concept on making framework which gives a big influence to the decision of the estimated area data in consideration of the system characteristic.

[note] Agricultural Land Information System

ALIS makes meshes on the scanned Google Map by a province of indicated country. On the system function, ALIS makes 5km meshes and 2.5km meshes as the wide mesh, and 600m meshes and 300m meshes as the area mesh[note1]. The wide mesh is made as an aggregate of area meshes and it is used for the functional improvement of screen operation and the recognition unit[note2] on province (national) borderline. The area mesh is made as a sample unit of area sample survey. ALIS is set the 300m mesh as the standard specification in consideration of the convenience on final field survey.

Picture 1: 2.5km wide mesh by 300m area mesh

ALIS does not assume all area meshes which made on Google Map as the sample framework but assumes area meshes including cultivated land of those as the sample framework. The sample framework should be treated as a class of "measurements" not "a factor to measure".

It is right to assume the area mesh which has the property (including the cultivated land) when an object to measure is decided as the agricultural land area like ALIS. For this purpose, ALIS operates the visible judgment on the Google Map screen, divides into "area mesh including cultivated land" and "area mesh not including cultivated land" and registers "area meshes including cultivated land" to system as the sample framework. (ALIS Operation Manual 3-2-2 Map Mesh Registration)

Picture 2: Area mesh including cultivated land and not including cultivated land

note 1 Area mesh is made by the consecutive bisection from the basic 5km wide mesh. Therefore, the size of area meshes become 625m and 312.5m by each exactly. These meshes are named as 600m mesh and 300m mesh by each for convenience because the area of area mesh itself does not give any influence to the estimated area value in area estimation of ALIS.

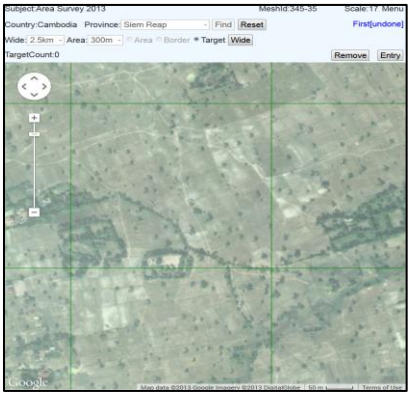
note 2 Wide meshes including borderline are excluded from survey target meshes. The reason is that researcher avoids entering to border area for field survey. The cultivated area in these wide meshes is added to the whole area by estimation from rate of cultivated area of area mesh into the borderline. On the other hand, ALIS has an additional function which change these wide meshes to survey target meshes (8. ALIS functions on making framework).

Although this operation is an operation to give a big influence[note3] on the determination of estimated area to let total number "N" of framework decided, it has a possibility to appear the different number of "N" due to the difference of picture analysis degrees of Google Map or technique and familiarization for visible judgment by operator. In addition, it is necessary to conduct the visible judgment with consideration[note4] that this framework will become the sample framework with property to be able to become the field survey sample. Therefore, the consideration for making of area framework in ALIS is shown below in order to make the area framework under the decided rule[note5].

1. Visible judgment of cultivated land use Scale17

The visible judgment use Scale17 on Map Mesh Registration screen. It scales up to Scale18 when the judgment is difficult for reason of low analysis degree. The area mesh is registered as "area mesh not including cultivated land" when it is difficult to judge the field condition by Scale18 as well.

As standard specification, ALIS displays 64 300m area mesh in 2.5km wide mesh with Scale15 and 256 300m area mesh in 5km wide mesh with Scale14 by click a wide mesh on the screen.



Picture 3: Scale 17 area mesh and scale 18 area mesh

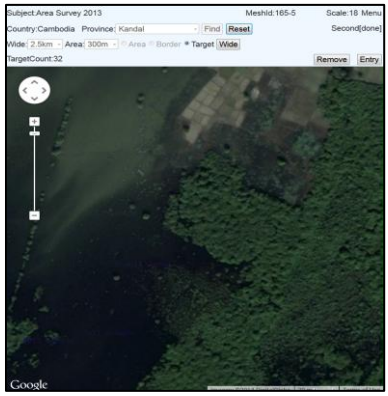
2. Narrow cultivated land in mountain area does not assume as a cultivated land

This rule is derived from below three reasons.

・When estimating total area, even if it excludes the small area samples[note6] from area framework, it does not give a big influence to the estimation result.[note7]

・It is important to increase the field survey efficiency for second area sample for more cultivated land borderlines and planted crops.

・It is necessary to consider about field survey impossible risk in road difficult to survey field and safety risk for researcher.



Picture 4: Area mesh including narrow cultivated land

It would be a proper indication of small area sample with less than 10% cultivated land area (It would be about less than 1.0ha in case of 300m mesh)[note8]

note 3 ALIS estimates the tentative agricultural land area by simple estimation formula $\bar{y} = \frac{\sum_{i=1}^{n} y_i}{n} N$ and the crops planted area based on the result of field survey.

note 4 To become to the "survey impossible sample" have to avoid as much as possible because the field survey sample (the second sample) has little number samples. It is a pre-condition for researcher to be able to enter into the field on the field survey and survey environment like agricultural road have to be considered for the field survey in mountain area. And this consideration is important in the view of safety survey.

note 5 On other statistical sample survey, the making of framework has to be conducted depending on the survey method and purpose.

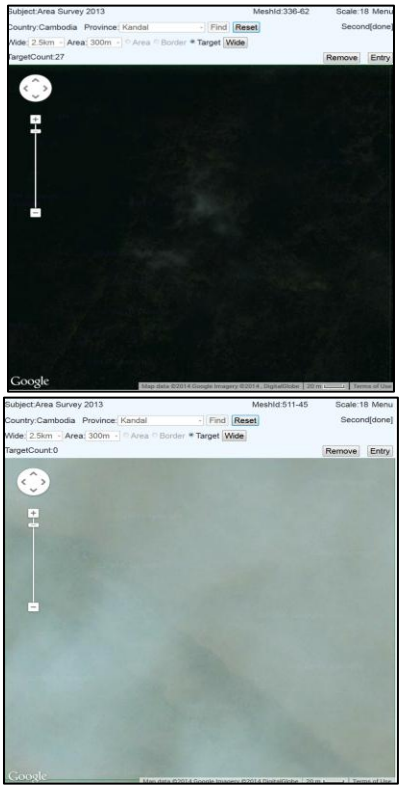
note 6 This definition itself is derived by particular survey environment of ALIS. This means that ALIS has an environment which it is possible to discern the field condition in area at the making of framework. It needs to note that this survey environment would not be appeared by general sampling survey and this definition logic itself would not appear.

note 7 This verification result is shown by a study report "Verification of excluding small sample from framework"

note 8 Framework has to be made effectively along the survey purpose. For example, the survey purpose such as grasping of burned field area would be made an entirely different framework.

3. The area mesh with low analysis degrees in mountain area assume as "area mesh not including cultivated land"

Google Map is constructed by layer pictures with different scale size. The map pictures at jungle and mountain area with no households are often displayed with the picture layer of small scale size and the situation that cannot determine ground condition occurs by scale size up too. On this situation, even if there are some cultivated lands in this area, it assumes that these cultivated lands are narrow land which it does not have a big influence to the estimated area value and it is ignorable. And these area meshes are registered as "area mesh not including cultivated land" by a wide mesh. The situation that cannot determine ground condition with cloud also conducts the same operation.



Picture 5: Area mesh with low analysis degrees and area mesh covered by cloud

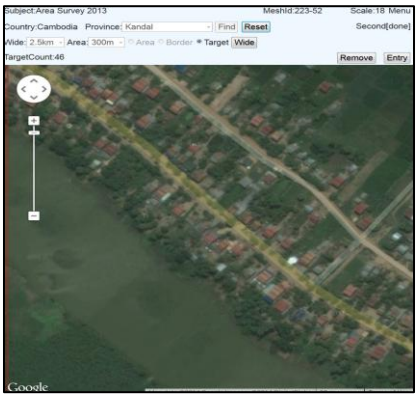
4. The burned field and the land after reclaimed do not assume as cultivated land

Even if the burned field and the land after reclaimed are possible to determine on the picture map and they have ignorable area, these lands do not assume as cultivated land. It is a corollary when considering the risk of safety of researchers. In addition, the agricultural statistics has focused to explain the agricultural productive capacity as the concept on cultivated land. So it is necessary to consider that it is difficult to confirm the successive intention by farmer for crop cultivation on the burned field and the land after reclaimed. If it needs to grasp the area of burned field and land after reclaimed, it can grasp these areas as an another survey by registering separately "survey name", "land category" and so on to ALIS (ALIS Operation Manual 3-1-5 Subject Registration). In this case, the survey designer needs to define newly the making definition of framework. And the field survey should not be conducted for the safety of researcher reason. It is expected to estimate these areas by simple estimation based on the map area in the first samples.

Picture 6: Area mesh including burned field

5. The garden field do not assume as cultivated land

This rule is guided from the concept of cultivated land in agricultural statistics described above and the point of view to avoid the trouble with residents when researcher moves in private land.



Picture 7: Area mesh including garden field

6. Defines clearly the treatment of orchard land

It depends on the statistical definition of countries conducting ALIS whether it includes orchard land in the total estimation of agricultural land area as cultivated land, however, it is necessary to define it before the visible judgment operation of ALIS and instruct it to the operator. It is expected to input to

the operator some information about the crop condition on fruit and industrial crop (like natural rubber) on a survey target province in advance. If it needs to grasp the area of only orchard land, it can grasp this area as an another survey by registering separately "survey name", "land category" and so on to ALIS (ALIS Operation Manual 3-1-5 Subject Registration).

Picture 8: Area mesh including orchard land

7. Other attention point

It is better to judge by multi-operators as much as possible and share the judging standard in the beginning stage of visible judgment operation. This sharing is aimed at the leveling of the land confirmation modified rate on target area in field survey. It is expected to conduct visible judgment according to the common recognition for stitch in upland field, regularity of trees in orchard, judging standard of cultivated land with water passage and approach path and so on.

8. ALIS functions for making frameworks

(1) ALIS displays the number of framework to Target Count on the screen of Map Area Registration. (ALIS Operation Manual 3-2-3 Map Area Registration)

(2) ALIS can register "area mesh including cultivated land" in block meshes by range specification operation. (ALIS Operation Manual 3-2-2 Map Mesh Registration Procedure 5)

(3) ALIS can change the installation of the wide mesh including borderline to survey target mesh. (ALIS Operation Manual 3-2-2 Map Mesh Registration Procedure 8)

(4) ALIS can correct the judgment of cultivated land after framework fixedness. That is ALIS can re-estimate the total agricultural land area by changing the number of framework "N" after estimation of agricultural land area. But the area meshes which registered as "survey completed (including cultivated land)" in second sample cannot correct the judgment. (ALIS Operation Manual 3-2-2 Map Mesh Registration Procedure 9)