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4868 Sample Plots Dataset for Land Cover Validation in Fujian Province of China (2019) —Content and Procedure

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Abstract: The land cover survey data is of fundamental importance to the validation of land cover classification products. The survey process of land cover types in Fujian province in 2019 is introduced in this paper. The process includes three steps, including designing of land cover type system, proceeding of field survey and inspecting of field data indoor. A total of 4,846 field points were collected, including 1,057 for pure coniferous forest, 164 for mixed coniferous forest, 1,313 for pure broadleaf forest, 141 for mixed broadleaf forest, 91 for conifer-broadleaf mixed forest, 808 for bamboo, 10 for mangrove, 226 for pure shrub, 30 for mixed shrub, 35 for grassland, 145 for paddy field crop, 223 for non-paddy field crop, 270 for artificial surface, 270 for water, 32 for bare soil and 31 for bare rock. The shared files with data size of 39.1 MB includes datasets of 4,846 sampling points and photos taken in situ survey. Sample points are archived in .kmz and .shp respectively with a total data size of 7.05 MB.

Keywords: Fujian province; land cover; survey dataset; 2019

1 Introduction

Land cover is refer to the composition of various matters on the earth's surface covered above the soil circle[1]. The spatial and temporal distribution of land cover is the result of interaction and feedback between surface environment and human activities, and determines the balances and distribution process of surface energy (e.g., latent heat and sensible heat) and matter (e.g., carbon and water)[2–5]. Research of land cover and its change is one of the hotspots among global change studies[6–10]. Land cover data product is vitally important for the study of land change processes, trends, driving forces of land use / land cover and their ecological, hydrological and environmental effects[2–3,11–15]. The field survey is an indispensable work to map highly accurate land cover products.

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Compared with the huge demand, the public validation data of the global land cover classification products is relatively lacking at present[16–17]. Two approaches, including interpretation of high-resolution remote sensing data and field survey, are commonly implemented to obtain validation data. The interpreted validating data can be produced with less time, labor and financial resources with relatively high accuracy in a short time. However, its accuracy also can be limited by the raw image quality, artificial factors and inconsistent acquisition date. In addition, interpreted validating data cannot ensure the authenticity of the validation sample especially for the fine land cover products which field survey can do. The using of field survey data to validate land cover classification products is the most accurate approach, although it consumes a lot of labor and financial resources. At present, the public field survey data at global or regional scale is extremely limited. Therefore, realizing the sharing of field survey can greatly promote the development of land cover change research.

Fujian province is located in the southeast of China, covering a land area of 12.14×10^4 km^2. Fujian is a relatively independent geographical unit in geomorphology and hydrology because it is front to the sea and back to high mountains. Its land area is separated from the surrounding three provinces by mountains with an altitude of more than 1,000 m. Generally, there are more hills, and less plain in Fujian. Thus, Fujian is also known as "Eight tenth mountain, one tenth water body and one tenth cropland". Belonged to humid sub-tropical monsoon climate, Fujian is warm and humid in spring, hot and humid in summer, warm and dry in autumn and cold and humid in winter and the annual precipitation is between 1,000 mm and 2,200 mm, with an average of 1,670 mm. The vegetation in Fujian are complex and diverse, with many kinds of plants, including south subtropical rainforest, mid-subtropical evergreen broadleaf forest, conifer-broadleaf mixed forest, coniferous forest, bamboo, mangrove, subtropical shrub-grassland, mountain meadow, etc. Due to the complexity of terrain and diversity of vegetation types, field survey data is urgently necessary for land cover research in this area. This paper aims to provide the field survey data for the land cover classification research on this area to promote the development of research on land cover change, processes, driving forces, and its ecological and hydrological impacts and effects on this area.

2 Metadata of the Dataset

The metadata of "*In situ* dataset of land cover types in Fujian province (2019)" [18] is summarized in Table 1, including the dataset name, authors, geographical region, year, data files, data publisher and data sharing policy, etc.

3 Processes and Methods of Data Collection

The entire process of data collection was divided into three parts, including preparation of field survey, proceeding of field survey and inspection of collected data.

The preparation of field survey includes four parts. Firstly, the main land cover types were listed out based on substantial literature of land cover in Fujian province. Secondly, according to the main land cover types in Fujian province, a land cover survey system was designed. As shown in Table 2, the land cover survey system was designed as three levels[7]. The Level 1 includes forest, shrub, grassland, crop, artificial surface, bare land and water. The Level 2 includes 11 types. Forest types were divided into coniferous forest, broadleaf forest, conifer-broadleaf mixed forest, bamboo and mangrove. The rest of Level 1 types were not divided further. The Level 3 includes 16 types. Coniferous forest types were di-

Table 1 Metadata summary of "*In situ* dataset of land cover types in Fujian province (2019)"

Items	Description
Dataset full name	*In situ* dataset of land cover types in Fujian province (2019)
Dataset short name	LC_Survey_FJ2019
Authors	Chen, Y. AAP-3042-2020, School of Geographical Sciences, Fujian Normal University, chenyl@fjnu.edu.cn Huang, X., School of Geographical Sciences, Fujian Normal University, hxy1050250101@163.com Lu, D. AAT-3553-2020, School of Geographical Sciences, Fujian Normal University, ludengsheng@fjnu.edu.cn Liu, S. AAT-3465-2020, School of Geographical Sciences, Fujian Normal University, xinqingweiyu@163.com Lin, W. AAT-3956-2020, School of Geographical Sciences, Fujian Normal University, wenkelin0210@gmail.com Peng, Z., School of Geographical Sciences, Fujian Normal University, 13420173263@163.com Wu, Y., School of Geographical Sciences, Fujian Normal University, yfwu111@163.com Pang, S., School of Geographical Sciences, Fujian Normal University, elvishpang@gmail.com Zhao, S. AAT-3964-2020, School of Geographical Sciences, Fujian Normal University, ygwork123@163.com
Geographical region	23°32′N–28°19′N, 115°50′E–120°43′E
Year	2019
Data format	.jpg, .docx, .kmz, .shp Data size 39.1 MB
Data files	Land cover date of Level 1, 2, 3, and photos and description of Level 3
Foundation(s)	Ministry of Science and Technology of P. R. China (2017YFD0600900)
Data computing environment	Aowei Interactive Map, Google Earth and ArcGIS
Data publisher	Global Change Research Data Publishing & Repository, http://www.geodoi.ac.cn
Address	No. 11A, Datun Road, Chaoyang District, Beijing 100101, China
Data sharing policy	***Data*** from the Global Change Research Data Publishing & Repository includes metadata, datasets (data products), and publications (in this case, in the *Journal of Global Change Data & Discovery*). ***Data*** sharing policy includes: (1) ***Data*** are openly available and can be free downloaded via the Internet; (2) End users are encouraged to use ***Data*** subject to citation; (3) Users, who are by definition also value-added service providers, are welcome to redistribute ***Data*** subject to written permission from the GCdataPR Editorial Office and the issuance of a ***Data*** redistribution license; and (4) If ***Data*** are used to compile new datasets, the 'ten percent principal' should be followed such that ***Data*** records utilized should not surpass 10% of the new dataset contents, while sources should be clearly noted in suitable places in the new dataset[19]
Communication and searchable system	DOI, DCI, CSCD, WDS/ISC, GEOSS, China GEOSS, Crossref

vided into pure coniferous forest and mixed coniferous forest. Broadleaf forest types were divided into pure broadleaf forest and mixed broadleaf forest. Conifer-broadleaf mixed forest, bamboo and mangrove were no divided further. Shrub types were divided into pure shrub and mixed shrub. Crop types were divided into paddy field crop and non-paddy field crop. Artificial surface and water were not divided further. Bare land was divided into bare soil and bare rock. Thirdly, a detail field survey questionnaire was made (Table 3). Finally, the survey routes were designed. In consideration of safety and convenience, rural roads are preferred.

During process of field survey, it was conducted through the interaction between manual operation and mobile phone software. Firstly, typical land cover points (Level 3) were selected by visual inspection (or with the help of telescopes). Then, photos of these land covers were recorded and field survey questionnaire was filled in manually. Finally, Aowei Interactive Map was used to collect the coordinate of these typical sampling points. The sampling points were strictly set as the center of a pure area at least larger than 30 m × 30 m

to ensure the purity.

Table 2 The land cover survey system in this study

Level 1	Level 2	Level 3
Forest	Coniferous forest	Pure coniferous forest
		Mixed coniferous forest
	Broadleaf forest	Pure broadleaf forest
		Mixed broadleaf forest
	Conifer-broadleaf mixed forest	Conifer-broadleaf mixed forest
	Bamboo	Bamboo
	Mangrove	Mangrove
Shrub	Shrub	Pure shrub
		Mixed shrub
Grassland	Grassland	Grassland
Crop	Crop	Paddy field crop
		Non-paddy field crop
Artificial surface	Artificial surface	Artificial surface
Water	Water	Water
Bare land	Bare land	Bare soil
		Bare rock

Table 3 The field survey questionnaire

Sample number	Longitude (E)	Latitude (N)	Level 3	Photo number	Sample description
ZZ20190729001	117°17′33.618″	24°48′17.101″	NPFC (Banana)	ZZ20190729001	Banana plantations
…	…	…	…	…	…
ZZ20190729087	117°15′1.564″	25°17′52.993″	PBF (Pomelo)	ZZ20190729087	Pomelo planting base

The indoor inspection was conducted through Aowei Interactive Map, Google Earth and ArcGIS. Firstly, longitude and latitude of all the sampling points were input into ArcGIS and were digitized according to the questionnaire. Then, all the sampling points were checked with photos, marks in Aowei Interactive Map and Google Earth image to ensure that they were strictly set as the center of a pure area at least larger than 30 m × 30 m. Wrong and repeated sampling points were removed during the check. Finally, all the sampling points were classified and sorted out according to Table 2 and were output in the formats of .shp and .kmz.

4 Results

4.1 Data Composition

In situ dataset of land cover types in Fujian province (2019) contains three levels of sampling points data and sampling points are archived in three folders respectively. Data named method, data description, data format, numbers of file and data size are summarized in Table 4.

Table 4 Data composition of "*In situ* dataset of land cover types in Fujian province (2019)"

Data type	Data named method	Data format	Number of file	Data size
Land cover_Level 1	%Land cover_Level 1's name%.shp %Land cover_Level 1's name%.kmz	.shp, .kmz	14	2.15 MB
Land cover_Level 2	%Land cover_Level 2's name %.shp %Land cover_Level 2's name %.kmz	.shp, .kmz	22	2.33 MB
Land cover_Level 3	%Land cover_Level 3's name%.shp %Land cover_Level 3's name%.kmz	.shp, .kmz	32	2.56 MB
Photos	%Land cover name in English%.jpg	.jpg	18	32.0 MB
Description of photos	Documentation in English and Chinese.docx	.docx	1	17.5 KB

4.2 Data Results

A total of 4,846 sampling points were collected and the land cover types were divided into three levels. The statistics of forest type sampling points is shown in Table 5, the statistics of non-forest type sampling points is shown in Table 6, and the statistics of non-vegetation type sampling points is shown in Table 7. The spatial distribution of the Level 1 sampling points is shown in Figure 1, including 3,584 for forest, 256 for shrub, 35 for grassland, 368 for crop, 270 for artificial surface, 270 for water and 63 for bare land (Figure 1). The spatial distribution of the Level 2 sampling points is shown in Figure 2, including 1,221 for coniferous forest, 1,454 for broadleaf forest, 91 for conifer-broadleaf mixed forest, 808 for bamboo and 10 for mangrove. Other land cover type sampling points are same as the Level 1 (Figure 2). The spatial distribution of the Level 3 sampling points is shown in Figure 3, including 1,057 for pure coniferous forest, 164 for mixed coniferous forest, 1,313 for pure broadleaf forest, 141 for mixed broadleaf forest, 91 for conifer-broadleaf mixed forest, 808 for bamboo, 10 for mangrove, 226 for pure shrub, 30 for mixed shrub, 35 for grassland, 145 for paddy field crop, 223 for non-paddy field crop, 270 for artificial surface, 270 for water, 32 for bare soil and 31 for bare rock (Figure 3).

Table 5 The statistics of forest type sampling points

Level 1	Numbers	Level 2	Numbers	Level 3	Numbers
Forest	3,584	Coniferous forest	1,221	Pure coniferous forest	1,057
				Mixed coniferous forest	164
		Broadleaf forest	1,454	Pure broadleaf forest	1,313
				Mixed broadleaf forest	141
		Conifer-broadleaf mixed forest	91	Conifer-broadleaf mixed forest	91
		Bamboo	808	Bamboo	808
		Mangrove	10	Mangrove	10

Table 6 The statistics of non-forest type sampling points

Level 1	Numbers	Level 2	Numbers	Level 3	Numbers
Shrub	256	Shrub	256	Pure shrub	226
				Mixed shrub	30
Grassland	35	Grassland	35	Grassland	35
Crop	368	Crop	368	Paddy field crop	145
				Non-paddy field crop	223

Table 7 The statistics of non-vegetation type sampling points

Level 1	Numbers	Level 2	Numbers	Level 3	Numbers
Artificial surface	270	Artificial surface	270	Artificial surface	270
Water	270	Water	270	Water	270
Bare land	63	Bare land	63	Bare soil	32
				Bare rock	31

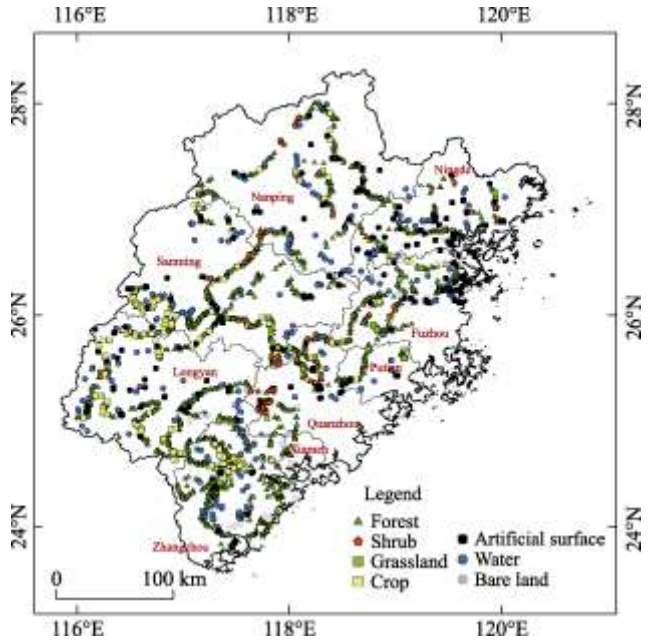

Figure 1 The spatial distribution of Level 1 sampling points

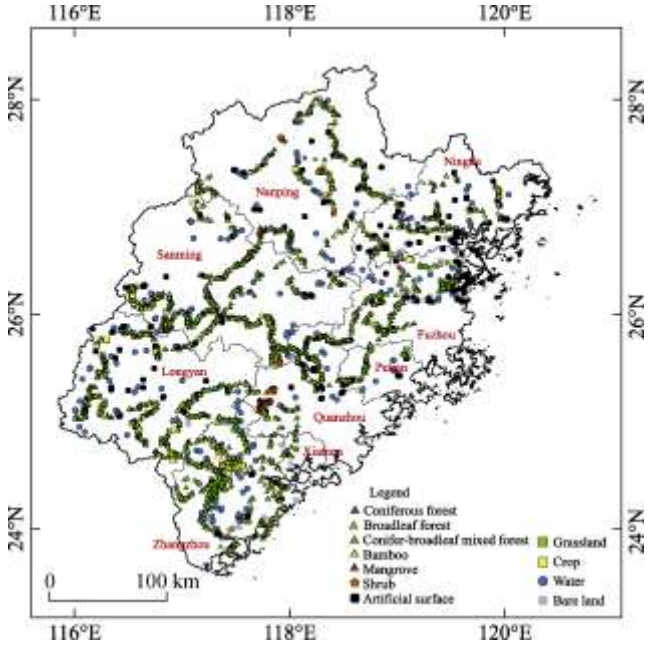

Figure 2 The spatial distribution of Level 2 sampling points

5 Discussion and Conclusion

Currently, fine land cover products are still lacking in Fujian province due to the complexity of terrain and diversity of vegetation types. Instead, most of research mainly focuses on the rough land cover scheme, small scale area or the identification of single land cover type. At national and global scale, land cover products have same problems of relatively rough land

cover scheme. Meanwhile, as the observed samples are limited, most global products cannot guarantee the classification accuracy in a certain small area. In this study, the substantial observed samples can be well used for mapping highly accurate land cover products with a finer land cover scheme.

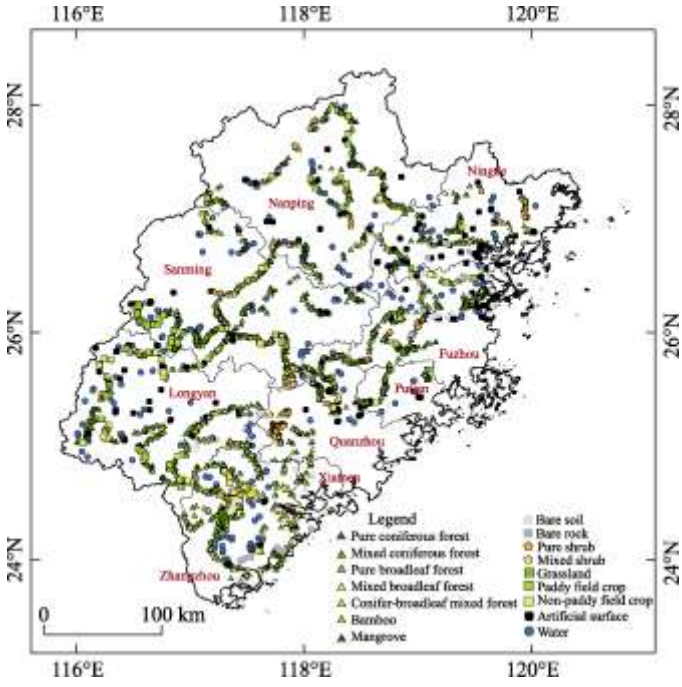

Figure 3 The spatial distribution of the Level 3 sampling points

Field survey data is of fundamental importance to the validation of land cover classification products. Given the huge challenge of accessing substantial observed samples at global scale, sharing policy of field data becomes more and more urgent[20]. The research team of Professor Xiao, X. M. of University of Oklahoma, which has set up a website platform for scholars to share their field photos (http://eomf.ou.edu/), is publicly praised as a good example[21]. The sharing of field survey data can improve the utilization rate of data, reduce the cost of related research, and promote the development of land cover change research. Thus, we call on all the scholars to share their observed land cover data in order to improve land cover products of large scale.

This paper introduces the process and content of land cover survey in Fujian province in 2019. Including 4,846 sampling points, the dataset basically covers the entire land area. The land cover types were divided into three levels. Users can choose an appropriate one according to their objectives. Through public data-sharing, the dataset will promote the development of research on land cover change and its processes, driving forces, as well as its ecological and hydrological impacts and effects on this area.

Author Contributions

Chen, Y. L. and Lu, D. S. designed the dataset. Chen, Y. L. and Huang, X. Y. contributed to the data processing. Liu, S. S., Lin, W. K., Peng, Z. W., Wu, Y. F., Pang, S. R. and Zhao, S participated in the field survey. Chen, Y. L. and Huang, X. Y. wrote the data paper.

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