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研究課題名（和文）東南アジア大陸山地部における小首長国-低地/山地関係の多様性

研究課題名（英文）Diversity in the relationship between low and upland society in mountain Southeast Asia

研究代表者

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交付決定額（研究期間全体）：（直接経費） 13,500,000円

研究成果の概要（和文）：本研究は、東南アジア大陸山地部に小首長国における低地/山地関係の多様性が何によって生み出されてきたのかに答えようとした。ラオス北部を対象に、低地と山地住民の健康状態に焦点を当て研究を行った。結果、水田や焼畑といった農業形態の違いや生態環境の違いによって、健康状態に差があるとは言えなかった。また、低地住民の方が、山地住民よりも酸化ストレスが高いことがわかった。ラオス北部の山地と低地間で、腸内細菌叢における種構成と種数において明確な違いが見られた。低地や山地といった微地形や微気象、および自然資源利用の違いや食用とする植物の多様性が関係していると思われた。

研究成果の学術的意義や社会的意義

東南アジア大陸山地部は低地民からの視点から語られることが多かったが、近年山地民の視点からの研究が増え、双方の視点からの研究が進んでいる。ただし、低地民からの視点とされる研究のほとんどは、より勢力の大きい支配者の視点であった。この研究は、辺境の低地民という新たな研究の視点を加え、東南アジア地域研究に貢献する。また、この研究は、ラオス北部住民の微量元素への暴露と腸内細菌叢の多様性を調査した。微量元素と腸内細菌叢の研究は、自給自足的生活を営む人口集団に関する研究が極めて少ない。よって、この研究で得られた成果は、それらの研究分野において、より包括的な理論形成に大きく貢献するものである。

研究成果の概要（英文）：The mountainous regions of mainland Southeast Asia are shaped by the interactions, conflicts and negotiations between lowland and upland societies. Prior studies attempting to understand the lowland-upland relationship have emphasized the superior agricultural productivity in the lowlands. However, the diverse and complex relationships between lowland and upland societies cannot be adequately encapsulated by the prevailing model. In constructing an alternative model, we concentrated on the health and physical condition of the inhabitants. We found that agricultural productivity does not dictate health status, as evidenced by the lack of significant variation in body size between lowland and upland populations, despite lower rice yield and production in swidden farming. Furthermore, health risk appear to be higher among lowland populations due to greater exposure to trace elements.

研究分野：地域研究

キーワード：東南アジア ラオス 水田 焼畑 健康 適応

1 . 研究開始当初の背景

The mountainous regions of mainland Southeast Asia represent a unique area, shaped by the interactions, conflicts and negotiations between lowland and upland societies that have developed under contrasting ecological conditions.

Notably, it has been posited that valley states held significant political sway over upland communities. These valley states primarily relied on wet rice farming, resulting in the emergence of chiefdom societies characterized by hierarchical social structures. These chiefdom societies subsequently established a federation, which in turn exerted control over the upland communities.

Conversely, upland regions served as refuges from centralized power. Although some upland inhabitants were subordinate to the state, others evaded its control and established egalitarian and highly mobile societies. It has been suggested that their agricultural practices, such as swidden farming, were deliberately designed to maintain distance from valley states and minimize undue interference.

To understand the lowland-upland relationship, previous studies have emphasized superior agricultural productivity in the lowlands. Technically, the yield and production of wet rice farming in these regions surpass those of swidden farming, leading to larger populations in lowland communities.

However, the applicability of the lowland dominance model may be confined to areas with sizable valleys, where royal capitals were established, and historical resources are accessible. Given that smaller valleys are more prevalent in this region, there is ample room to scrutinize whether this model can be universally applied. Interestingly, the population ratio of upland inhabitants has consistently exceeded that of the lowlanders. This implies a substantial degree of difficulties is required for lowland dwellers to sustain their political dominance. As such, this study posits the existence of diverse, complex relationships between lowland and upland societies that cannot be encapsulated by the prevailing model.

In constructing an alternative model, we concentrated on the health and physical condition of the inhabitants. We postulated that if agricultural productivity has been a key determinant of population size, it should also be reflected in the residents' health status.

2 . 研究の目的

To test the hypothesis, we assessed the severity of food shortages, habitability of both lowland

and upland regions, the adaptability to local ecosystems, and the nutritional intake of both lowland and upland dwellers.

3 . 研究の方法

Research sites: This study was carried out in three villages in the Oudomxay province of Northern Laos. Nam Nyon village, situated in a remote upland area, sustains its livelihood through swidden and wet rice farming, as well as gathering wild plants. Na Savang village, located in a small valley, has a population primarily engaged in wet rice farming for an extended period. Lastly, Na Lae village lies in a larger valley housing provincial capital, where residents are involved in wet rice farming and small-scale businesses.

The research was undertaken during both the rainy and dry seasons in 2018 and 2019, with the study's components as follows:

- The severity of food shortages: We conducted anthropometric measurements, such as the height and weight of residents, were conducted. These metrics, along with BMI, were subsequently compared across the three villages.
- Habitability: Oxidative stress levels were used as an index. We collected urine samples from all three villages and measured urinary 8-OHdG, 8-isoprostane concentrations and telomere length. In parallel, we also quantified the urinary concentration of trace elements, including arsenic, cadmium, lead, and selenium was also measured.
- Adaptability: We established the diversity of gut microbiome as the index of adaptability. Fecal samples were collected from all three villages, which the gut microbiome was enumerated and analyzed.
- Nutritional intakes: The dietary patterns, nutritional intakes and livelihood of Nam Nyon village were surveyed.

4 . 研究成果

Upon analyzing the BMI and height of individuals aged 20 to 60 years old of both sexes, no significant differences were observed between lowland and upland dwellers. This suggests that variations in agricultural practices are not likely to influence health status. Consequently, the lower productivity associated with swidden farming cannot be attributed to health status.

Conversely, within the upland village, the dietary patterns varied significantly different between households practicing wet rice and swidden farming. Households reliant on swidden farming consumed more wild plants and wild boar, leading to higher dietary fiber and vitamin C intake. In contrast, households practicing wet rice farming consumed more gourd leaves, aquatic animals and salt, resulting in higher niacin and vitamin B12 intake.

A significant difference in the diversity of gut microbiome was observed between the upland and lowland villages, even though the villages were merely 10km apart as the crow flies. The diversity in Nam Nyon village was remarkably higher than in Na Savang village. While the former was estimated to have between 400 to 2000 species, the latter only hosted 200 to 900 species. These differences in gut microbiomes diversity are attributable to the variations in landscape, natural resources use, and the diversity of wild plants consumed. Additionally, a more diverse gut microbiome implies a broader adaptability to a range of natural conditions.

Population demonstrating higher levels of oxidative stress were observed in the lowland villages. Although it was plausible that modernization exerted a considerable influence on oxidative stress, variations in ecosystems also likely contributed to these stress levels. The urinary concentration of arsenic was higher in the lowland village, while cadmium exposure was more prevalent in the upland village. Despite exposure to both these trace elements can cause DNA and lipid damage, increasing oxidative stress, the level was higher in the lowland village. This suggests that, alongside modernization, differences in livelihoods--including natural resources use influenced by ecosystems--could also be factors impacting health status.

In conclusion, agricultural productivity does not necessarily correspond to differences in health status. This is suggested by the lack of significant variation in body size between lowland and upland populations, despite the lower yield and production of rice in swidden farming. Additionally, health risk appears to be higher among lowland populations due to greater exposure to trace elements. Lastly, lowland and upland populations seem to adopt distinct adaptation strategies to their environment. Lowland populations utilize a specialist strategy, while upland populations adopt a generalist approach.

5. 主な発表論文等

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2. 論文標題 Divergence in Nutritional Intake and Physical Activity Patterns Among Households in a Village of Ethnic Minorities in Northern Laos at the Initial Stage of Health Transition	5. 発行年 2022年
3. 雑誌名 Human Ecology	6. 最初と最後の頁 287 ~ 305
掲載論文のDOI (デジタルオブジェクト識別子) 10.1007/s10745-022-00310-y	査読の有無 有
オープンアクセス オープンアクセスとしている (また、その予定である)	国際共著 該当する
1. 著者名 Mizuno Yuki, Inaba Yohei, Masuoka Hiroaki, Kibe Mihoko, Kosaka Satoko, Natsuhara Kazumi, Hirayama Kazuhiro, Inthavong Nouhak, Kounnavong Sengchanh, Tomita Shinsuke, Umezaki Masahiro	4. 巻 -
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オープンアクセス オープンアクセスとしている (また、その予定である)	国際共著 該当する
1. 著者名 Mizuno Yuki, Inaba Yohei, Masuoka Hiroaki, Kibe Mihoko, Kosaka Satoko, Natsuhara Kazumi, Hirayama Kazuhiro, Inthavong Nouhak, Kounnavong Sengchanh, Tomita Shinsuke, Umezaki Masahiro	4. 巻 868
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オープンアクセス オープンアクセスとしている (また、その予定である)	国際共著 該当する
1. 著者名 Mizuno Yuki, Masuoka Hiroaki, Kibe Mihoko, Kosaka Satoko, Natsuhara Kazumi, Hirayama Kazuhiro, Inthavong Nouhak, Kounnavong Sengchanh, Tomita Shinsuke, Umezaki Masahiro	4. 巻 34
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2. 論文標題 Smallholder's labor allocation for livelihood diversification: A case study in an upland village in northern Laos	5. 発行年 2020年
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2. 論文標題 Translating the State: Ethnic Language Radio in the Lao PDR	5. 発行年 2018年
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3. 書名 動く・集まる	

〔産業財産権〕

〔その他〕

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6. 研究組織

	氏名 (ローマ字氏名) (研究者番号)	所属研究機関・部局・職 (機関番号)	備考
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研究分担者	梅崎 昌裕 (Umezaki Masahiro) (30292725)	東京大学・大学院医学系研究科(医学部)・教授 (12601)	
研究分担者	Badenoch Nathan (Badenoch Nathan) (50599884)	京都大学・国際戦略本部・特定准教授 (14301)	削除：2018年11月27日

7. 科研費を使用して開催した国際研究集会

〔国際研究集会〕 計1件

国際研究集会 Special Seminar of Biodemography	開催年 2017年～2017年
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8. 本研究に関連して実施した国際共同研究の実施状況

共同研究相手国	相手方研究機関
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ラオス	ラオス農林業研究所	ラオス熱帯公衆衛生研究所		
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