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THE DIVERSITY LIVELIHOOD OF CORN FARMER HOUSEHOLDS: EVIDENCE FROM TRANSMIGRATION PROGRAM OF GORONTALO PROVINCE, INDONESIA

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ABSTRACT

The corn farmer households examined in this study participated in the dryland transmigration program to enhance welfare by furnishing livelihood capital to poor farmer households. This research compares the livelihood capital of corn farmer households in the transmigration areas of Gorontalo and Boalemo districts, Gorontalo, Indonesia, and examines its impact on their livelihood strategy selection. The study involved 240 poor corn farmer households. Data analysis was conducted by computing the livelihood capital index through entropy weighting analysis, followed by multinomial logistic regression analysis to examine the influence of livelihood capital on livelihood strategies. Findings indicate a higher.

level of livelihood capital in Boalemo Regency than in Gorontalo Regency, with Boalemo District outperforming in physical and human capital. In contrast, the Gorontalo district excels in natural and social capital. However, the financial capital of corn farmer households in both regions.

still needs to be improved. Natural and human capital significantly influences the likelihood of corn farming households opting for on-farm strategies over a combination of on-farm and off-farm strategies. In the case of on-farm and off-farm strategies, natural capital substantially enhances the probability of corn farmer households selecting both on-farm and off-farm strategies rather than solely on-farm and non-farm strategies. Conversely, physical capital diminishes the likelihood of corn farmer households adopting both on-farm and off-farm strategies compared to the combination of on-farm and non-farm strategies.

Keywords: Livelihood, corn farmers, livelihood strategies, transmigrants, entropy, Gorontalo

INTRODUCTION

Most people in Gorontalo province work in the agricultural sector and rely on corn farming as the primary source of household income. In fact, in one year, the average is planted twice, with a corn planting time of approximately four months/planting. This condition indicates a time lag that corn farming households can utilize from planting to harvest. This time can be used to carry out other economic activities to increase household income and reduce poverty.

Gorontalo Province was designed as a central corn province starting from the launch of the Corn Agropolitan by the Gorontalo Provincial government. Along with that, compared with other provinces in Indonesia, corn farming is not the main source of income for households. However, in Gorontalo Province corn farming is the main source of income for households. From the aspect of total production, corn also occupies higher production level than the production of other food crops. Whereas other provinces show different data, for example, Central Java province, rice production is 9,655,653.98 tons GKG/ 2019 > corn 3,467,314.00 tons/ 2019. East Java production of rice 9,580,933.88 tons/ 2019 > corn 6,131,163 tons/ 2019. East Kalimantan rice production 262,434.52 tons/ 2020 > corn 8,379.00 tons/ 2015. West Sumatra in 2021 rice production 1,317,209.38 tonnes > corn 948,063.16 tonnes. This condition differentiates the pattern of agricultural development in Gorontalo compared to other regions.

In line with the conditions above, Gorontalo Province is also promoting a transmigration program with a dry land pattern that links the program to the development of the corn commodity as the main source of income for farming households in the transmigration area. In research (Murtisari, Irham, et al. 2022) it is explained that the transmigration program with corn farming has an impact on reducing poverty. Supported by research (Yusuf, Baruwadi and Halid, Contribution of Corn Farming to Household Income of Corn Farmers in Tonala Village, Telaga Biru District, Gorontalo Regency 2019) explains that corn farming contributes to household income better than other commodities.

So far, the research conducted regarding corn farming has only been limited to corn farming income (on farm) (Datau, Saleh and Murtisari 2017) (Nurcahya, Noor and Novianty 2022) (Lahandu, Antara and Muis 2016), the feasibility of corn farming (Ashari 2020), contribution of corn farming to household income (Yusuf, Baruwadi and Halid 2019), distribution of corn farming income (Murtisari 2015). However, the relationship between corn farming of farmer households in transmigration areas and sustainable livelihood assets has never been studied. This research wants to confirm whether the development of corn plantations in transmigration areas can provide better livelihoods or vice versa.

Livelihood is the abilities, assets (material and social resources), and activities needed for the means of life (Chambers and Conway 1992). In several studies, it is known as Sustainable Rural Livelihood (SRL), which studies how farmers obtain their livelihood or source of livelihood using existing resources (Bhaduri, Sinha and Knorringa 2017). Livelihood strategies are divided into three types, namely

activities originating from one's corn farming activities as an on-farm strategy. Strategies arising from one's farming activities other than corn farming are known as off-farm strategies, and economic activities originating from activities outside agriculture are known as non-farm strategies.

Research related to measuring livelihood capital uses five dimensions of capital consisting of natural, physical, financial, human and social capital (Kamaruddin and Samsudin 2014) (Su, et al. 2019) (Yi, Xixi and Lu 2022) (Su, Aaron, et al., Sustainable Livelihood Capital and Strategy in Rural Tourism Households: A Seasonality Perspective 2019). The difference between this research and the previous one lies in the indicators used in each dimension of livelihood capital measurement. The new indicators include communication equipment owned in physical capital, indicators of the level of insurance claims obtained and ownership of food reserves from one's harvest in financial capital, indicators of agricultural technical capacity of workers in human capital, while in social capital by including indicators of openness to immigrants living in the neighborhood. This research was also conducted in a transmigration area that has a diverse socio-cultural background.

METHOD

Time and research sites

The research was conducted in 2022. Research locations in Gorontalo Province include Gorontalo and Boalemo Regencies. The basis for choosing the location is because the two regencies are transmigration development areas with a dry land pattern, and corn farming is the main source of income for farming households. The level of corn production at the research location is higher than other food commodities such as rice and soybeans (BPS-Statistics of Gorontalo Province 2023).

The two regions were grouped based on the timing of the transmigration program placement and regional poverty levels. Transmigration placements in Gorontalo Regency consist of Ayumolingo village in 2013 and Bukit Aren village in 2017, while in Boalemo Regency placements were spread across Harapan, Raharja Villages in 1978 and Saritani Village in 2011. Apart from that, the number of poor people in Gorontalo Regency (66,640 people/ 18.74%) and Boalemo (31,970 people/ 17.71%) is greater than other districts (BPS-Statistics of Gorontalo Province 2023). Based on these conditions, Gorontalo and Boalemo Regencies were chosen as research locations.

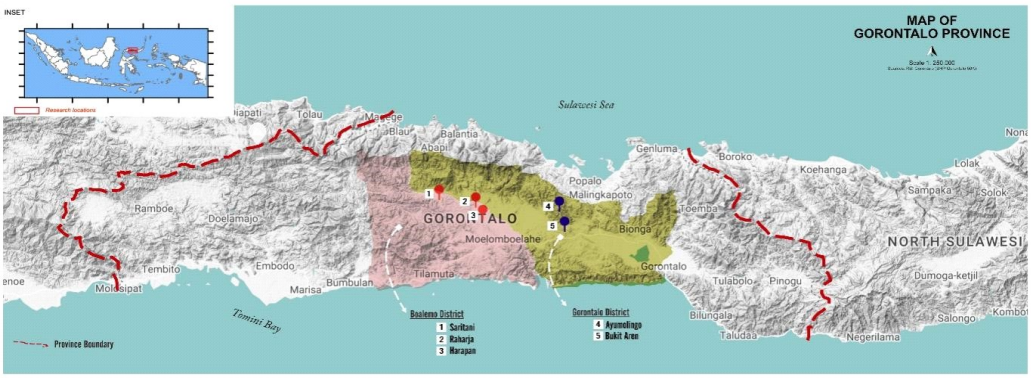

Figure 1 Map of research locations

Sampling technique

The sample selection technique was cluster random sampling with the criteria of respondents being corn farming households in the transmigration area who received one of the social assistance programs, including the Family Hope Program (PKH), Direct Cash Assistance (BLT), or Non-Cash Food Assistance (BPNT). The number of research respondents is 240 responses, consisting of 120 respondents from Gorontalo Regency and 120 respondents from Boalemo Regency. Data collection was carried out using trained enumerators who were able to speak local languages with strict supervision from researchers. The distribution of respondents in each research location is shown in Table 1.

Data analysis

Analysis of weighting data for measuring livelihood capital uses the entropy method with the following formula (Yi, Xixi and Lu 2022) (Cheng, et al. 2022) (Su, Aaron, et al., Sustainable Livelihood Capital and Strategy in Rural Tourism Households: A Seasonality Perspective 2019):

$$C = \sum_{n=0}^{n} \frac{I_n}{T_n} \quad \text{.....(1)}$$

Where C is the criteria score for each category of livelihood capital $(0 \leq C \leq 1)$); n is number of indicators.

x'_{ij} *standardized value* x_{ij}. x_{ij} is data from household *I, household j.*

$$x'_{ij} = \left(\frac{x_{ij} - x_{min}}{x_{max} - x_{min}}\right) \times 100\ \% \quad \text{.....(2)}$$

The weight value is calculated using entropy method formula. p_{ij} is the weight of household *i* on indicator *j,* formulated as follows:

$$p_{ij} = x'_{ij} / \sum_{i=1}^{m} x'_{ij} \quad \text{.....(3)}$$

The entropy value of indicator j is formulated as follows:

$$e_j = -1 / lnm \sum_{i=1}^{m} p_{ij} lnp_{ij} \quad \text{.....(4)}$$

W_j is the weight value of indicator *j* formulated as follows:

$$w_j = (1-e_j) / \sum_{i=1}^{n} (1 - e_j) \quad \text{.....(5)}$$

LCI is formulated as follows:

$$LCI = \sum_{i=1}^{n} w_j x'_{ij} \quad \text{.....(6)}$$

regression with the following equation:

$ln \frac{p}{1-p} = a + b_1$ *natural capital* $+ b_1$*physical capital* $+ b_1$*Financial capital* $+ b_1$*human capital Social capital* $+ b_1$*location dummy* $+ e_1$ .....(7)

P is probability that a corn farming household implements a complete agricultural livelihood strategy with independent variables of natural, physical, financial, human, and social capital.

Table 1 Research Respondents

Regency	Village	Number of respondents
Gorontalo	Ayumolingo	60
	Bukit Aren	60
Boalemo	Harapan and Raharja	60
	Sari Tani	60
Total respondents		240

Source: Primary data,2022

Table 2 Description of research variables

Asset	Indicator Name	Indicator Definition
Natural	Farming land area	Actual area of agricultural land (Ha)
	The quality of the cultivated land	1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = very good
	Water quality	1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = very good
Physical	Residential status	0 = not own, 1 = own
	Owned electronic goods	0 = don't have, 1 = 1-2 units, 2 = more than 2 units
	Owned communication devices	0 = don't have, 1 = 1-2 units, 2 = more than 2 units
	Number of chickens owned	0 = haven't chickens, 1= 1-2 chickens, 2 = 3-4 chickens, 3 = diatas 4 ekor
Financial	Ownership of a permanent source of income	0 = no, 1 = yes
	Level of insurance claims obtained	1 = class 3, 2 = class 2, 3 = class 1
	Ownership of money savings	0 = haven't, 1 = have saved money
	Ownership of jewelry savings	0 = no, 1 = yes
	Ownership of food reserves from one's own harvest	0 = none, 1 = less than 50 kg, 2 = 50 – 100 kg, 3 = above 100 kg
Human	Possession of knowledge related to the main job as a farmer	0 = no, 1 = yes
	Physical condition supports carrying out work as a farmer	0 = no, 1 = yes
	Solving problems at work	0 = let it go, 1 = solve it by asking other people's opinions and helped by other people, 2 = solve it yourself
	Agricultural technical capacity of workers	1 = very poor, 2 = poor, 3 = average, 4 = good, 5 = very good.
Social	Level of communication with the social environment	1 = very poor, 2 = poor, 3 = average, 4 = good, 5 = very good
	Openness to transmigrant that living in the home environment	1 = very disagree, 2 = disagree, 3 = neither, 4 = agree, 5 = very agree
	Involvement in farmer groups	0 = no, 1 = yes
	Level of satisfaction with service facilities in the village	1 = very poor, 2 = poor, 3 = average, 4 = good, 5 = very good

Research variable

The constituent indicators for each livelihood capital variable are shown in Table 2.

RESULTS

General description of the research location and characteristics of research respondents

Gorontalo Province is one of the provinces on the island of Sulawesi, Indonesia, which is a transmigration program development area. The transmigration program aims to reduce poverty and improve the welfare of the population through population movement activities from densely populated provinces to sparsely populated provinces. The population of Gorontalo Province is 1,192,737 people or 0.43 percent of Indonesia total population in 2022. Gorontalo Province has four transmigration program development areas, one of which is Gorontalo and Boalemo Regencies. The

percentage of the population of Gorontalo Regency is 33.44 percent, and Boalemo Regency is 12.45 percent of the population of Gorontalo Province. Both districts have corn farming potential, with total production in Gorontalo Regency amount to 142,863 tons (22.20%) in second rank and Boalemo Regency 121,655 tons (18.90%) in third rank of total corn production in Gorontalo Province (BPS-Statistics of Gorontalo Province 2023). This potential is in line with dry land pattern transmigration program, which makes corn farming as the main source of income for farming households in the transmigration area. Despite their potential, the two districts still have homework to reduce poverty because the percentage of poor people in 2022 is 18.74 percent (first place) for Boalemo Regency and 17.71percent (third place) for Gorontalo Regency, the total poor population in the Province Gorontalo. Based on the conditions in the area, efforts are needed to explore the livelihood capital of farming households in transmigration areas to survive.

The educational level of corn farming households in Gorontalo and Boalemo Regencies is dominated by elementary school (SD). Although from the aspect of education, corn farming households in Gorontalo Regency have better human capital than farming households in Boalemo Regency. In research (Tran, et al. 2018) (Habib, Arlyawardana and Aziz 2023) states that education is main factor determining to choose better diversification of livelihood strategies.

Participation in training activities includes agricultural and non-agricultural because training must consider agricultural and non-agricultural factors together in order to increase the effectiveness of training in overcoming the challenges of low production. Most farming households in Gorontalo Regency (58%) and Boalemo (88.33%) have never attended skills training. The practice of developing human resources through skills training activities has a significant impact on human capital, knowledge, and social capital (Feisali and Niknami 2021) (Al-Tit, et al. 2022). Farming skills training has the opportunity to increase agricultural production (Daudu, et al. 2023), while non-agricultural skills training has the opportunity for farming households to have a non-farm source of income either as workers or entrepreneurs because this is one way to get out of poverty (Murtisari, Irham, et al., Do poor farmers have entrepreneurial skills, intention, and competence? Lessons from transmigration program in rural Gorontalo Province, Indonesia 2022). These two programs also can potentially improve the welfare of farming households (Wu and Hu 2023) (Daudu, et al. 2023).

The conditions are similar to the aspect of land area. The majority of land area for the two groups of households ranges from 0.5 – 1 Ha, and there are even 11.67 percent of corn farming households in Gorontalo district and 20.83percent in Boalemo district with a land area of more than 1 Ha. Ownership of sufficient land area makes corn farming activities the main source of livelihood. The natural capital owned in the form of land area can optimize farming activities (Sati 2022) and achieve sustainable livelihoods (Ulya, et al. 2021).

Based on family size, the majority of 3 to 4 people is one family in both corn farming households in Gorontalo and Boalemo

Regencies. For farming households, family members are important because corn farming activities involve family labor, for example, planting, maintaining and harvesting activities. Supported by research (Leonard, Deane and Gutmann 2011) which explains that children of farmers are involved in farming activities and are even related to the extent of agricultural operations and intensity of land use. Family welfare is also influenced by the economic contribution of family members, one of which is the role of the wife in livelihood strategy of farming households (Muzakiyah and Hartoyo 2017).

The agricultural sector, which is identical with difficulty in accessing credit (Diaz, et al. 2022), apparently also occurs in corn farmer households in Gorontalo Province. Based on the results of the analysis in Table 3 below, it can be seen that majority of corn farming households in Gorontalo Regency obtain access to money loans through family (34.17%), cooperatives (19.17%), friends (18.33%), government banks (16.67%) and mill owners (9.17%). In comparison, the majority to credit access for farmer households in Boalemo Regency comes from government banks (29.17%), family (28.33%), friends (20.83%) and mill owners (13.33%). The majority of farming households access non-formal financing sources because it provide easy administrative procedures, while the reason for accessing formal financing sources is because the loan interest is lower than non-formal finance. This fact is interesting because the existence of rice mill owners as non-formal financial institutions is very beneficial for farming households to obtain farming capital and make it easier to pay these loans with harvest production. In line with research (Lemessa and Gemechu 2016) which states that poor farming households have limitations in accessing formal financing institutions.

Natural Capital

Corn farming households with the highest natural capital are in Gorontalo district. However, the condition of natural capital in Gorontalo and Boalemo districts is not much different because both groups of farming households rely on nature through corn farming as the main source of household livelihood. It is evident from the analysis results in Table 4 below that corn farming households in the two districts have excellent water and soil quality. Several studies also state that households engaged in agriculture have high natural capital both in terms of quality and quantity (Su, Aaron, et al., Sustainable Livelihood Capital and Strategy in Rural Tourism Households: A Seasonality Perspective 2019) (Yi, Xixi and Lu 2022).

Physical Capital

The physical capital condition of corn farmer households in Boalemo district is higher than in Gorontalo (Table 4). Physical capital ownership is considered very good in both residential ownership and livestock ownership, such as chickens. Research states that livestock ownership can provide alternative sources of livelihood opportunities to meet the domestic needs of farming households (Ali, et al. 2021) such as meeting consumption needs (Bundala, et al. 2020). In research (Katagame, et al. 2017) it is explained that livestock ownership has a positive impact on household income and poverty reduction as well as socio-economic sustainability at the household level (Taruvinga, et al. 2022), in addition to indicators of

Table 3. Characteristics of corn farming household/ regency

Variable		Gorontalo		Boalemo	
		amount	%	amount	%
Age (years)	< 27	1	0.83	5	4.17
	27-37	37	**30.83**	23	19.17
	38-48	37	30.83	43	35.83
	49-59	32	26.67	28	23.33
	60-70	13	10.83	18	15.00
	> 70	0	0.00	3	2.50
Education	No school	0	0.00	5	4.17
	Elementaru school	77	64.17	93	77.50
	Junior high school	17	**14.17**	9	7.50
	Senior high school	26	**21.67**	12	10.00
	College	0	0.00	1	0.83
Land area (Ha)	< 0.5	4	3.33	1	0.83
	0.5 - 1	101	84.17	88	73.33
	1.1 – 2	14	11.67	25	20.83
	> 2	1	0.83	6	5.00
Access to training	Yes	50	**42**	14	11.67
	no	70	58	106	88.33
Family Size (people)	1	1	0.83	4	3.33
	2	20	16.67	30	25.00
	3	34	28.33	31	25.83
	4	**47**	**39.17**	**36**	**30.00**
	≥ 5	18	15.00	19	15.83
Access to credit	Family	**41**	**34.17**	**34**	**28.33**
	Friend	**22**	**18.33**	**25**	**20.83**
	Village goverment	0	0.00	8	6.67
	Cooperative	23	**19.17**	1	0.83
	Individual lender/ rice mill owner	11	9.17	16	13.33
	Private Bank	1	0.83	0	0.00
	Government Bank	20	16.67	35	29.17
	Other	2	1.67	1	0.83

Source. primary data. 2022

ownership of electronic goods such as televisions and refrigerators. and communication devices such as cell phones still need to be higher for corn farming households in Gorontalo Regency compared to Boalemo Regency. Even though in the current era, communication tools have become a vital necessity that must be owned. This condition is one of the factors in delaying information for corn farmers in Gorontalo Province.

Financial Capital

The results of the financial capital analysis shown in Table 4 below explain that the financial capital of corn farming households in Gorontalo and Boalemo Regencies is the smallest among the other livelihood capital measurement dimensions. The reason for the low financial capital is because most corn farming households do not have a steady source of income every month and only source it from corn farming which receives the harvest twice a year. In line with research (Huang, et al. 2021) which explains that limited financial capital prevents agricultural households from participating in non-agricultural activities. Most livelihood resources obtained are used for daily living needs such as food, health and education. Ownership of savings in the form of money, jewelry, insurance or food is very small or non-existent. The impact of smaller financial livelihood capital tends to result in corn farming

households being food insecure (Shobe, Narcisse and Christy 2017) and needing help accessing farming financing capital (Khanal and Omobitan 2020).

Human Capital

The human capital conditions of corn farmer households in Gorontalo (0.657) and Boalemo (0.659) districts are similar (Table 4). Physical conditions that support work as a farmer occupy the highest value compared to other indicators. Research (Salimah and Muflikhati 2016) explains that physical capital has a positive effect on family welfare. Moreover, corn farming activities in poor households are identical to physical activities. Indicators of work-related knowledge need to be improved in corn farmer households in Gorontalo Regency because this indicator has the lowest value compared to other indicators. In contrast, in Boalemo Regency the indicators that need to be improved are agricultural technical capacity, for example skills in using agricultural technology.

Social Capital

Social capital is a very important source of livelihood capital for farmers because it can increase the income and productivity of poor household workers. Based on the results of the analysis in Table 4 below, it show that the social capital of corn farmer households in Gorontalo Regency (0.697) is higher than Boalemo Regency (0.623). Communication with the surrounding environment is going well in farming households in Gorontalo Regency, thereby opening up opportunities for diversification of livelihood sources for corn farming households in the region. Supported by research (He, et al. 2022) explains that individual social capital has a positive effect on non-agricultural livelihood strategies. The advantage of Boalemo Regency's social capital is the high level of participation of farmers in joining farmer groups, thus providing opportunities for farmers to gain access information, agricultural assistance, and skills training. In line with research (Abenakyo, et al. 2007), which explains that strong social capital facilitates access to livelihood assets, improves problem solving skills and empowers women in decision making. Research (Xiong, et al. 2021) suggests that it is necessary to increase social capital in order to increase the capacity for sustainable livelihoods household and achieve poverty alleviation.

Based on the results of the Livelihood Capital Index analysis in Table 4 below, it can be concluded that livelihood capital of corn farming households in Bolaemo Regency is higher than Gorontalo Regency (0.556 > 0.546). Human capital in Boalemo Regency is ranked highest compared to other livelihood capital. Good physical condition, ability to overcome problems, adequate knowledge, and proficiency in agricultural technical capacity make Boalemo Regency farming households superior in human capital. Good human capital conditions influence increasing agricultural production (Ayuningtyas 2022). Different conditions occur in Gorontalo Regency because the value of social capital is the highest among other livelihood capital. There is a tendency for farming households that have high social capital to have self-confidence in making decisions in community groups (Abenakyo, et al. 2007).\

Table 4 Livelihood Indicator Index

Capital Type	Evaluation Indicator	Gorontalo Regency		Boalemo Regency	
Natural capital	Agricultural land area	0.333	0.630	0.378	0.622
	Water quality	0.782		0.868	
	Soil quality	0.775		0.619	
Physical Capital	Residential status	0.950	0.519	0.875	0.658
	Ownership of electronic goods	0.249		0.593	
	Ownership of communications devices	0.120		0.520	
	Ownership of farming chicken	0.758		0.643	
Financial Capital	Permanent source of income	0.242	0.225	0.158	0.217
	Insurance ownership	0.211		0,025	
	Ownership savings of gold	0.125		0,092	
	Ownership savings of money	0.339		0.432	
	Ownership savings of food reserve	0.208		0.376	
Human Capital	Job related knowledge	0.458	0.657	0.692	0.659
	Physical condition	0.925		0.750	
	How to deal with problems	0.588		0.641	
	Agricultural technical capacity	0.656		0.552	
Social Capital	Communication with society	0.830	0.697	0.647	0.623
	Acceptance of new residents	0.603		0.597	
	Participation in farmer groups	0.733		0.667	
	Satisfaction with village facilities	0.623		0.582	
Livelihood Capital Index		0.546		0.556	

Analysis of the Influence of Livelihood Capital on Livelihood Strategies

Several studies state that ownership of livelihood capital influences the implementation of livelihood strategies. Research (Giri 2022) explains that there is a positive relationship between livelihood capital and livelihood strategies. The decision of livelihood diversity is also influenced by livelihood capital (Wang, et al. 2021). Several components of livelihood capital also influence the transformation of agricultural to non-agricultural livelihood strategies (He and Ahmed 2022), one of which is through on-farm, off-farm, and non-farm diversification (Yussuf and Mohamed 2022).

In this research, livelihood strategies are grouped into three, including livelihood strategy 1 (on farm), livelihood strategy 2 (on farm + off farm), livelihood strategy 3 (on farm + non farm). Livelihood strategy 1 only comes from own corn farming activities. Strategy 2 comes from a combination of corn farming and working as a farm laborer on someone else's land, while strategy 3 comes from a combination of corn farming and off-farm activities. Of these three categories, strategy 3 was chosen as the reference category as a comparison for analysis, so that the results of the analysis of strategies 1 and 2 will be compared with strategy 3.

The result of the analysis of natural assets is probability corn farming households choose strategy 1 (on farm) is higher than strategy 3 (on farm + non farm). The results of this analysis prove that the availability of natural capital in the form of land ownership, good quality soil and water will provide greater opportunities to engage in corn farming. In research (Simo, Kanowski and Barney 2019) it is stated that

Table 5 Multinomial Logistic Regression of Corn Farming Households in the Transmigration Area of Gorontalo Province

Description Assets	Parameter Estimates			
	$B_{on\ farm}$	Sig *On farm*	$B_{on\ farm+off\ farm}$	*Sig On farm+ off farm*
Natural	322.789	**0.069***	470.702	**0.003****
Physical	-199.585	0.183	-255.174	**0.050***
Financial	-176.256	0.195	-126.129	0.299
Human	253.164	**0.058***	-130.526	0.213
Social	80.024	0.604	22.260	0.871
Dummy location	-0.259	0.569	-1.444	**0.001****

Source. Primary data is processed
Information: * = sig value < 0,10, ** = sig value < 0,05, *** = sig value < 0,01

natural capital plays a vital role in the livelihood of rural households and they even oppose development that sacrifices natural capital because it can rob them of sources of income from the environment (environmental income), even income from the environment. Nature has an opportunity to reduce poverty (Mawa, Tumusiime, and Babweteera 2021). The results of this research are supported by research (Bhandari 2013) which states that ownership of natural assets hinders farmer households' decisions to transition sources of livelihood from agriculture to non-agriculture. Not only natural assets but human assets also influence the probability of corn farmer households choosing strategy 1 to be greater than strategy 3. This condition occurs when linked to livelihood capital analysis, showing that the advantages of indicators in human capital lie in the physical conditions that support carrying out activities. Farming so that human assets provide a greater probability for farming households to engage in farming activities. Profitability of farming production can be achieved one way by increasing human capital (Karpova and Muravieva 2019) such as skills training.

The analysis results on strategy 2 explain that Natural assets provide a greater probability for farming households to choose livelihood strategy 2 (on farm and off farm) than livelihood strategy 3. Physical capital offers a smaller probability influence for farming households to choose strategy 2 than strategy 3. These results indicate that households have physical capital such as ownership of a residence and its equipment, communication equipment and livestock will provide opportunities for farming households to try diversify their livelihoods by going outside the agricultural sector. Communication tools make it easy for farmers to quick access information, thus opening up farmers' insight into non-farm business opportunities, while livestock ownership can be used as capital to open new businesses. This research is supported by (Oktalina, et al. 2016), who explains that physical capital is one of the most priority assets farming households use.

CONCLUSION

The Livelihood Capital Index of corn farming households in Boalemo regency is higher than in Gorontalo regency, but each region has different livelihood potential. Boalemo Regency has the potential to excel in physical and human capital, while Gorontalo Regency excels in Natural, Financial, and Social Capital. There

are striking differences in physical capital so even though Gorontalo district is superior in three livelihood capitals, overall livelihood capital is higher in Boalemo district. Natural and human capital have a higher influence on the probability of farming households choosing on-farm livelihood strategies. Different conditions are shown in higher probabilities for choosing on farm and non farm strategies, which are influenced by natural and physical capital.

Efforts are needed by the government to increase financial capital in two regions by providing diversified sources of livelihood that provide a source of income between planting and harvesting times, providing opportunities for corn farming households to access formal sources of financing with an easily accessible administrative process. Providing farmer household management literacy in managing family finances, including what percentage of funds should be allocated for household needs and savings funds.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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