



Effectiveness Analysis of Government Livestock Assistance in Increasing Livestock Population in Humbang Hasundutan Regency, Indonesia

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

This research employs a qualitative approach to explore in-depth insights into the implementation of the government livestock assistance program in Humbang Hasundutan Regency. Through this approach, data is obtained from field observations, interviews with recipient farmers, and a review of documents related to program implementation. Data analysis involves delineating the program's implementation stages, identifying inhibiting factors, and evaluating the program's impact on livestock populations and the welfare of farming communities. The findings indicate that, despite the well-executed stages of distribution, counseling, mentoring, and monitoring/evaluation, the livestock

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assistance program has not been effective in increasing the livestock population. Community empowerment, the main goal of the program, is hindered by the lack of skills among selected livestock aid recipients. As a recommendation, the study suggests that local governments conduct more selective verification and selection of prospective aid recipients to make the program more effective and targeted. Aid recipients are also advised to be consistent in livestock maintenance according to the technical guidance of the relevant department and enhance their understanding of proper livestock farming practices. This study contributes to a better understanding of the implementation of livestock assistance programs at the local level and offers guidance for improving policies and the implementation of similar programs in the future.

Keywords: Livestock assistance; implementation; community empowerment; livestock population; welfare.

1. INTRODUCTION

The government consistently strives to support the domestic beef self-sufficiency program [1]. The primary goal of this self-sufficiency program is to develop people's livestock, as over 90 percent of beef cattle in Indonesia come from smallholder farms [2]. The livestock subsector not only significantly contributes to the national economy but also plays a crucial role in providing employment, making it a pillar in the national economic improvement effort. This is confirmed by the results of the Inter-Census Agricultural Survey (SUTAS, 2018), which recorded that the number of livestock households in Indonesia reached 13.56 million. Currently, livestock issues in developing countries like Indonesia are a vital focus globally, considering the sustainability of livestock is crucial to meeting global animal protein needs Tarawali, [3] Bai, 2018, Mekuriaw, [4].

One of the most consumed animal proteins in Indonesia is beef and buffalo meat (large ruminants). This meat is not only easily accessible but also rich in protein and can be processed into various dishes. The demand for beef at the national level continues to rise with population growth, but this is not balanced with the availability of slaughtered cattle in Indonesia. This creates a significant opportunity to develop livestock, especially among local communities. Beef cattle development is a necessity to meet the national demand for meat.

The production of beef and buffalo meat in Indonesia in 2022 reached 436,700 tons [2]. Proportionally, Java Island contributed the most with 59.12 percent or around 258,170 tons. Meanwhile, Sumatra Island contributed about 16.47 percent, and Bali & Nusa Tenggara Island contributed about 13.22 percent to the total production of beef and buffalo meat in 2022.

Cattle farming for meat production is an industry within the agricultural sector, and its operational scope extends beyond on-farm activities to encompass both upstream and downstream components as integral supporting business units. Upstream activities include significant undertakings such as seed production, feed manufacturing, and livestock healthcare, all of which play a crucial role in ensuring the outstanding productivity of cattle. On the downstream side, post-harvest handling assumes a pivotal role in enhancing the quality and value addition of beef [5].

Humbang Hasundutan Regency, a region where the majority of its population earns a living as farmers/livestock keepers, has a very supportive geographical condition to be developed as a livestock development area. Since its establishment in 2003, the Humbang Hasundutan Regency Government has made various efforts to increase the income of the local community, especially local farmers, through livestock assistance programs funded by local, provincial, and national budgets.

Effective policies go through three stages: policy formulation, policy implementation, and policy assessment or evaluation [6]. The research results of Wantassen [7] indicate that cattle/buffalo farmers need to work hard to increase their income and livestock production, while Jover's research (2019) states that the risk of entry and spread of diseases is higher for small-scale livestock producers than for commercial producers. This evaluation is important considering [8] mentions that four factors influence the increase in the population of livestock assistance, namely group institutions, member skills, the availability of abundant food, and livestock mentoring. Therefore, this study aims to analyze the effectiveness of the government's livestock assistance program in

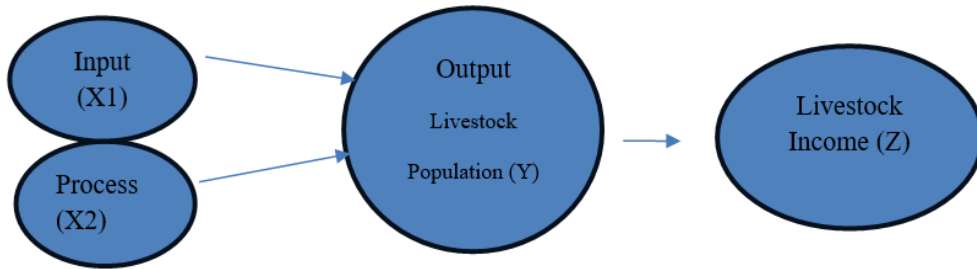


Fig. 1. Research model

increasing the livestock population in Humbang Hasundutan Regency and the factors influencing the program's performance.

2. METHODS

This research adopts a quantitative approach to elucidate the relationships between variables. This approach involves statistical calculations and is based on positivism philosophy to examine a population or sample [9]. Samples are randomly selected, data is collected through research instruments, and the analysis is quantitative. The research strategy used is a survey method with a structured questionnaire. The survey method is employed to gather information about respondents' attitudes, knowledge, and behaviors. The research instrument is analyzed using statistics with the assistance of the SmartPLS application.

2.1 Research Location

The research location is purposively chosen, encompassing nine sub-districts with livestock farming groups as recipients of buffalo and cattle

assistance in the last ten years in Humbang Hasundutan Regency, North Sumatra Province.

Subsequent analysis employs a Likert scale in completing questionnaires distributed to respondents. The Likert scale is used to measure respondents' attitudes, opinions, and perceptions of social phenomena. Variables are measured using five-item questions with scores ranging from strongly disagree to strongly agree.

2.2 Research Variable

The level of effectiveness measurement for input, process, and output variables is conducted for each indicator. Performance effectiveness criteria are observed based on performance percentage and are determined according to the guidelines of Decree of the Minister of Home Affairs No. 690.900-327 of 1996. In this study, data analysis is conducted through two main stages: descriptive analysis and PLS-SEM analysis. Descriptive analysis is used to answer questions related to the mechanism of the government livestock assistance program in



Fig. 2. Map of Humbang Hasundutan Regency

Table 1. Research variables and indicators

No	Variable	Indicator	Effectiveness Criteria	Effectiveness Score
1	Input (X1)	a. Program Socialization (X1.1) b. Appropriateness of Aid to Needs (X1.2) c. Appropriateness of Aid Amount (X1.3) d. Timeliness of Aid Distribution (X1.4) e. Program Target Accuracy (X1.5)	a. Very effective b. Effective c. Sufficiently effective d. Ineffective e. Very ineffective	5 4 3 2 1
2	Process (X2)	a. Coaching/Training/Mentoring (X2.1) b. Response Speed of Officers to Complaints (X2.2) c. Monitoring (X2.3) d. Evaluation (X2.4)	a. Very effective b. Effective c. Sufficiently effective d. Ineffective e. Very ineffective	5 4 3 2 1
3	Output	Livestock Population Increase (Y)	a. Very effective b. Effective c. Sufficiently effective d. Ineffective e. Very ineffective	5 4 3 2 1
4	Output	Livestock Income (Z)	a. Very effective b. Effective c. Sufficiently effective d. Ineffective e. Very ineffective	5 4 3 2 1

Humbang Hasundutan Regency. Meanwhile, PLS-SEM analysis is carried out using SmartPLS version 3.2.7 software. PLS (Partial Least Square) is used as a variance-based structural equation approach to predict causal relationships between variables in the model.

2.3 Data Analysis

In PLS-SEM analysis, two crucial aspects are considered: outer model analysis (measurement model) and inner model analysis (structural model). The outer model analysis aims to test internal validity and reliability through Convergent Validity, Discriminant Validity, Composite Reliability, Average Variance Extracted, and Cronbach Alpha tests. Meanwhile, inner model analysis is used to predict causal relationships between variables, considering coefficients of determination (R²) and Predictive Relevance (Q²).

This approach provides a robust foundation for understanding the mechanism of the livestock assistance program and gaining in-depth insights into the relationships between the variables

tested in the model. This analysis is expected to make a significant contribution to understanding the effectiveness of the government livestock assistance program at the local level.

2.4 Overview of the Research Location

Geographically, Humbang Hasundutan Regency is situated on the Northern latitude line 1°-2°28' and Eastern longitude line 98°10'-98°58'. It shares borders with Samosir Regency to the North, Tapanuli Utara Regency to the East, Tapanuli Tengah Regency to the South, and Pakpak Bharat Regency to the West. Located in the middle of North Sumatra Province, the elevation in this area ranges from 330 to 2,075 meters above sea level. The total area of Humbang Hasundutan is 251,765.93 hectares, with 250,271.02 hectares of land and 1,494.91 hectares of lakes. Among the ten districts, Parlilitan District is the largest with an area of 727.75 km², while Baktiraja District is the smallest with an area of 22.32 km². The climate in this region is classified as a tropical wet climate, with temperatures ranging from 17°C to 29°C.

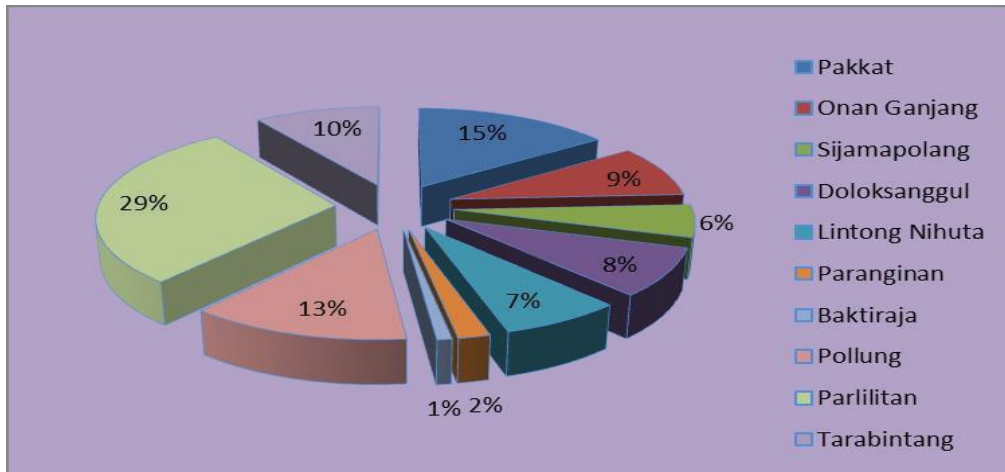


Fig. 3. Area distribution by District (%), 2022
 Source: BPS Humbang Hasundutan, 2022

2.5 Agriculture and Livestock Sector

The agricultural sector dominates Humbang Hasundutan Regency, covering sub-sectors such as food crops, horticulture, bio-pharmaceuticals, and plantations. Various agricultural commodities are cultivated, including rice, corn, cassava, sweet potatoes, coffee, chili, oranges, shallots, rubber, bio-pharmaceutical plants, and others. In the livestock sub-sector, the most commonly raised animals include buffalo, beef cattle, pigs, free-range chickens, and ducks. In 2020, the livestock population reached 12,088 buffalo, 1,701 beef cattle, 10,618 pigs, 225,254 free-range chickens, and 27,015 ducks [2]. Lintong Nihuta District is the center for buffalo and pig farming, while Parlilitan District is the center for free-range chickens and ducks, with a significant population of 43,396 free-range chickens and 3,674 ducks.

2.6 Characteristics of Respondents

This research required the determination of respondent characteristics to understand the profile of respondents who served as the research data source. The characteristics of respondents studied include:

2.6.1 Age

The majority of respondents were in the age range of 30-40 years, accounting for 52.9%, or 55 respondents.

2.6.2 Highest education attainment

The majority of respondents had a high school education, accounting for 70.2%, or 73 respondents.

2.6.3 Gender

The majority of respondents were male, accounting for 93.3%, or 97 respondents, while female respondents were only 6.7%

2.6.4 Occupation

The majority of respondents worked as farmers, accounting for 62.5%, or 65 respondents. Entrepreneurs and civil servants also made significant contributions, each accounting for 14.4% and 11.5%, respectively.

Table 2. Characteristics of respondents based on age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< 30 Tahun	17	16.3	16.3	16.3
	30 - 40 Tahun	55	52.9	52.9	69.2
	41 - 50 Tahun	27	26.0	26.0	95.2
	51 - 60 Tahun	5	4.8	4.8	100.0
Total		104	100.0	100.0	

Table 3. Characteristics of respondents based on highest education attainment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Junior	10	9.6	9.6	9.6
	Senior	73	70.2	70.2	79.8
	Diploma	15	14.4	14.4	94.2
	Graduate	6	5.8	5.8	100.0
	Total	104	100.0	100.0	

Table 4. Characteristics of respondents based on gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	97	93.3	93.3	93.3
	Female	7	6.7	6.7	100.0
	Total	104	100.0	100.0	

Table 5 Characteristics of Respondents Based on Occupation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Farmer	65	62.5	62.5	62.5
	Entrepreneur	15	14.4	14.4	76.9
	Teacher	3	2.9	2.9	79.8
	Civil servant	12	11.5	11.5	91.3
	Others	9	8.7	8.7	100.0
	Total	104	100.0	100.0	

3. RESULTS

3.1 Implementation Mechanism of Livestock Assistance Program in Humbang Hasundutan Regency

The livestock assistance program in Humbang Hasundutan Regency is a government initiative aimed at reducing poverty in the livestock sector. Launched in 2003, the program is implemented based on the Regional Regulation (Perda) of North Sumatra Province Number 51 of 2001. The process of distributing assistance for cattle involves socialization of the program's concept, eligibility criteria, and the rights and obligations of cattle breeders. Requirements include villages with farmer groups that aim to improve self-sufficiency in beef. Recipients must be responsible and form a farmers' group. A written contract between the village and the recipient regulates the prohibition of selling cattle, a 3-year maintenance period, livestock rotation, and reporting on cattle development every 6 months.

The program provides two female cattle to each family member of the farmers' group. If a cow gives birth to two calves, one of them is returned to the government for reallocation to another farmer (rotation). Counseling and training on cattle breeding involve topics such as the

production of fermented feed, health care, cage maintenance, and feeding patterns. Counselling teams and field assistants from the livestock department regularly accompany farmers.

The livestock rotation process involves returning developed cattle to the community or other group members who have not received assistance, through a mechanism known to the department. The program implements a revolving pattern, where farmers' groups must return livestock assistance in the same condition as at the initial distribution.

Monitoring and evaluation activities are carried out periodically and gradually according to the stages of livestock business development. Technical teams compile control reports covering the progress of the assistance program based on performance indicators and issues faced.

3.2 Effectiveness of Government Assistance for Goat Farming

3.2.1 Descriptive analysis

Based on respondents' answers related to the variables used in this study, the descriptive analysis summary is presented in Table 6.

Table 6. Descriptive analysis

Indicator Code	Likert Score										Index (%)	
	STS		TS		RR		S		SS			TCR Value
	F	%	F	%	F	%	F	%	F	%		
X111	0	0%	6	6%	25	24%	59	57%	14	13%	393	39,30
X112	0	0%	12	12%	25	24%	53	51%	14	13%	381	38,10
X121	0	0%	12	12%	18	17%	37	36%	37	36%	411	41,10
X122	0	0%	15	14%	20	19%	39	38%	30	29%	396	39,60
X123	0	0%	9	9%	30	29%	46	44%	19	18%	387	38,70
X131	0	0%	9	9%	19	18%	61	59%	15	14%	394	39,40
X132	0	0%	0	0%	26	25%	76	73%	2	2%	392	39,20
X141	0	0%	9	9%	17	16%	65	63%	13	13%	394	39,40
X142	0	0%	0	0%	27	26%	73	70%	4	4%	393	39,30
X151	0	0%	3	3%	23	22%	64	62%	14	13%	401	40,10
X152	0	0%	6	6%	20	19%	74	71%	4	4%	388	38,80
X153	0	0%	9	9%	17	16%	69	66%	9	9%	390	39,00
Average												39,33
Criteria												Sufficient
X211	0	0%	10	10%	23	22%	59	57%	12	12%	385	38,50
X212	0	0%	7	7%	30	29%	58	56%	9	9%	381	38,10
X221	0	0%	8	8%	27	26%	47	45%	22	21%	395	39,50
X222	0	0%	6	6%	27	26%	42	40%	29	28%	406	40,60
X231	0	0%	9	9%	29	28%	52	50%	14	13%	383	38,30
X232	0	0%	10	10%	37	36%	38	37%	19	18%	378	37,80
X233	0	0%	17	16%	22	21%	37	36%	28	27%	388	38,80
X241	0	0%	10	10%	24	23%	40	38%	30	29%	402	40,20
X242	0	0%	3	3%	34	33%	43	41%	24	23%	400	40,00
X243	0	0%	18	17%	24	23%	42	40%	20	19%	376	37,60
X244	0	0%	6	6%	25	24%	46	44%	27	26%	406	40,60
X251	0	0%	13	13%	25	24%	42	40%	24	23%	389	38,90
X252	0	0%	9	9%	25	24%	41	39%	29	28%	402	40,20
Average												39,16
Criteria												Sufficient
Z11	0	0%	8	8%	45	43%	51	49%	0	0%	355	35,50
Z12	0	0%	15	14%	43	41%	46	44%	0	0%	343	34,30
Z13	0	0%	7	7%	54	52%	43	41%	0	0%	348	34,80
Z14	0	0%	3	3%	50	48%	51	49%	0	0%	360	36,00
Average												35,15
Criteria												Sufficient
Y11	0	0%	20	19%	25	24%	59	57%	0	0%	351	35,10
Y12	0	0%	20	19%	33	32%	51	49%	0	0%	343	34,30
Y13	0	0%	16	15%	38	37%	50	48%	0	0%	346	34,60
Y14	0	0%	18	17%	40	38%	46	44%	0	0%	340	34,00
Average												34,50
Criteria												Less

X111 - X153: Effectiveness of Government Goat Farming Assistance

- Statements X111 to X153 show relatively high average values, with a

"Sufficient" criterion, indicating that respondents tend to have a positive perception of the effectiveness of government goat farming assistance.

- Special attention to statements X122 and X151, which have high average values, indicates that respondents respond very well to these variables.

X211 - X252: Goat Farming Development Index

- Statements X211 to X252 also show relatively high average values, with a "Sufficient" criterion, indicating that respondents tend to have a positive perception of goat farming development indicators.
- Statement X222 stands out with a very high average value, indicating strong support from respondents for this indicator.

Z11 - Z16: Environmental and Livestock Facility Aspects

- Statements Z11 to Z16 show slightly lower average values, with a "Less" criterion, indicating that respondents have a lower perception of environmental and livestock facility aspects.
- Statement Z15 stands out as one of the indicators with a higher average value but still falls into the "Sufficient" criterion.

Y11 - Y16: Government Officer's Role in Livestock Counseling

- Statements Y11 to Y16 show relatively high average values, with a "Sufficient" criterion, indicating that respondents tend to have a positive perception of the government officer's role in livestock counseling.
- Statements Y15 and Y16 stand out with high average values, indicating strong support from respondents for the government officer's role in counseling.

In general, the results of the descriptive analysis show that respondents have a positive perception of the effectiveness of government goat farming assistance, goat farming development indicators, and the government officer's role in livestock counseling. However, specific aspects with lower average values should be noted and can be a focus for improvement or enhancement.

3.2.1.1 Outer model analysis (Measurement Model)

Measurement Model Evaluation (Reflective Model):The outer model is used to define how each indicator relates to its latent variable. The outer model in this study can be seen in the following diagram:

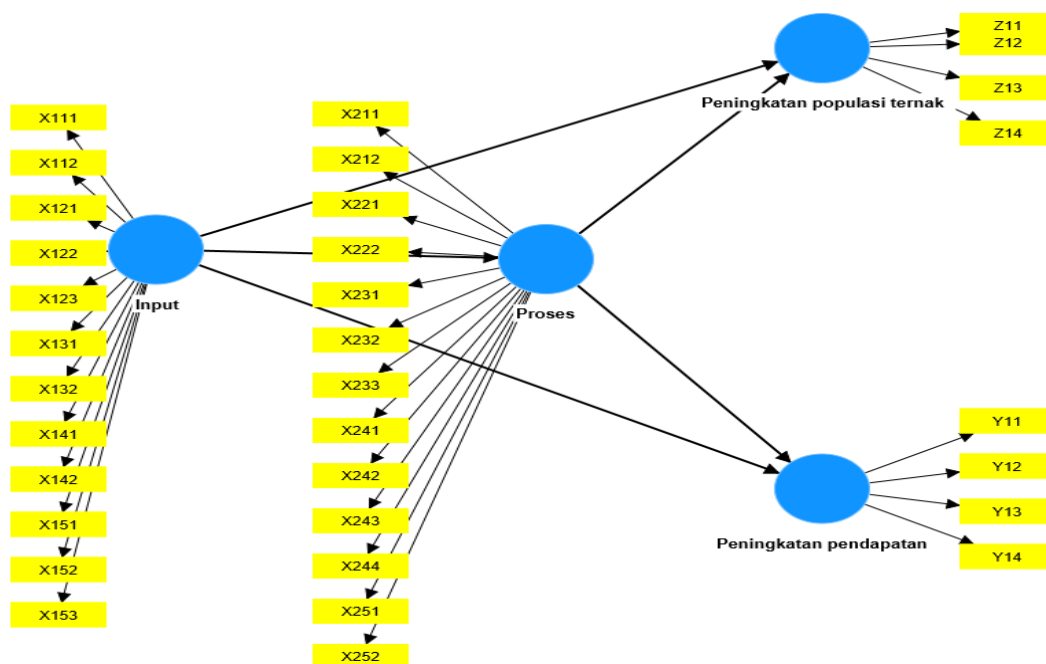


Fig. 4. Path diagram outer model by smart PLS

3.2.2 Loading Factor (LF)

In this study, the loading factor test results show that all indicators have loading factor values above 0.7, meeting the criteria for convergent validity. This indicates that each indicator effectively reflects its measured latent variable. However, it is essential to note that the interpretation of the loading factor should always be considered in a theoretical and substantive context.

3.2.3 Composite reliability

The composite reliability test results indicate that all variables meet the reliability criteria, with composite reliability values above 0.8. This signifies that the constructs measured by the indicators in each variable can be relied upon.

3.2.4 Average Variance Extracted (AVE)

AVE values for each variable also meet the convergent validity criteria, with values above 0.5. This indicates that the variability explained by the indicators within a variable is substantial.

3.2.5 Cross loading

However, the discriminant validity test results based on cross-loading factors show that some indicators have low cross-loading values. Therefore, further consideration is required to evaluate whether these indicators are theoretically justifiable or need revision.

3.3 Significance of Weight Values (T-Value)

- In a formative measurement model, significant weight values are crucial to ensure that indicators play a significant role in shaping the latent variable they measure.
- The significant T-Value results ($T > 1.96$) for all indicators indicate that each indicator has a significant contribution to the latent variable they measure.

3.4 Multicollinearity (VIF - Variance Inflation Factor)

- The VIF test is used to identify multicollinearity symptoms among manifest variables.

- The VIF test results show that the VIF values for all indicators are below the threshold (< 10). This indicates that there is no multicollinearity in the model, ensuring that the interpretation of the weight of each indicator is reliable.

3.5 Conclusion of Formative Measurement Model Evaluation

- Based on the results of T-Value analysis and VIF test, it can be concluded that the formative measurement model in this study is valid and does not exhibit multicollinearity symptoms.
- The validity of the indicators provides confidence that each indicator significantly contributes to the formation of the measured latent variable.
- The absence of multicollinearity symptoms ensures that each indicator provides unique information and is not overly correlated with each other.

3.6 Structural Model Analysis

The structural model analysis was conducted to understand the relationships between constructs, assess significance values, and examine R2 values in the conducted research model. The path diagram of the inner model is presented:

In the path diagram, the calculated t-values for each exogenous latent variable on the endogenous latent variable are evident. To meet the criteria for a structural model, the evaluation is based on the R2 values for the endogenous latent variables.

These R2 values signify the extent to which the variability of endogenous latent variables can be explained by the associated exogenous latent variables. Higher R2 values indicate that the model is capable of explaining a significant amount of variation in the endogenous latent variables.

The assessment of R2 values is crucial for gauging the adequacy and reliability of the structural model in elucidating causal relationships among variables in this research.

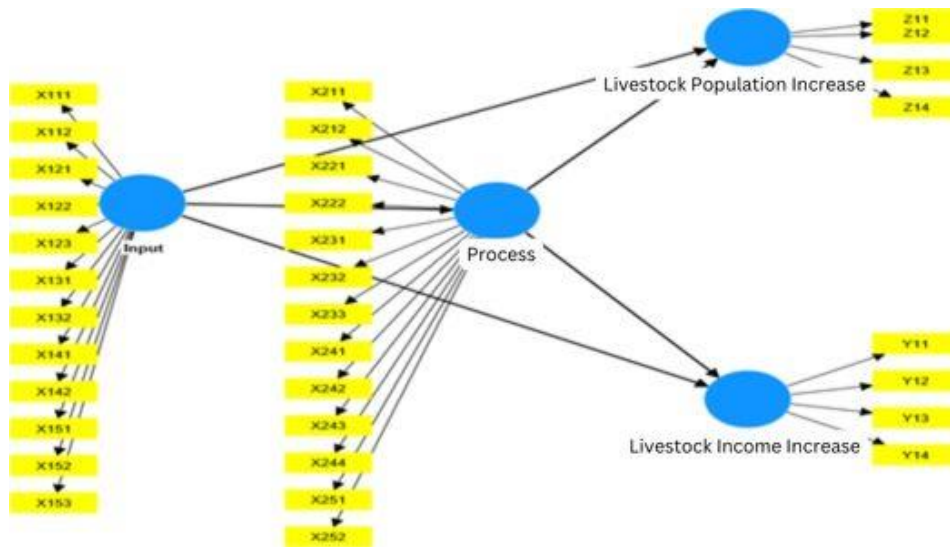


Fig. 5. Diagram inner model

Table 7. R2 values for the endogenous latent variables

Endogenous Latent Variables	Value R ²
Increased Income (Y)	0.553
Increased Livestock Population (Z)	0.404
Process (X2)	0,891

4. DISCUSSION

4.1 Impact of Input Variables on Livestock Income

In this study, input variables exhibit a significant influence on livestock income in Kabupaten Humbang Hasundutan. With a path coefficient of 0.522 and a probability value of $0.012 < 0.05$, the results indicate that the implementation of input variables has a positive impact on livestock income. Indicators such as program socialization, aid accuracy, aid quantity, timing of aid provision, and program targets are identified as contributors to the increase in livestock income.

4.2 Impact of Input Variables on Livestock Population

Input variables also significantly affect the livestock population, as evidenced by a path coefficient of 0.685 and a probability value of $0.000 < 0.05$. This finding suggests that the implementation of input variables, including program socialization, aid accuracy, aid quantity,

timing of aid provision, and program targets, contributes to the growth of the livestock population in Kabupaten Humbang Hasundutan.

4.3 Impact of Input on the Assistance Process

The analysis reveals that input variables exert a significant influence on the livestock assistance process, with a path coefficient of 0.947 and a probability value of $0.000 < 0.05$. This indicates that the effective implementation of input variables, such as program socialization, aid accuracy, aid quantity, timing of aid provision, and program targets, can influence the course of the livestock assistance process.

4.4 Impact of the Process on Livestock Income

Despite encompassing elements such as coaching, training, mentoring, officials' responses to complaints, monitoring, and evaluation, the process variables do not significantly affect livestock income (path coefficient = 0.121, probability = $0.573 > 0.05$).

4.5 Impact of the Process on Livestock Population

Similarly, the process variables do not significantly influence the livestock population (path coefficient = 0.077, probability = 0.706 > 0.05). Although the process variables cover various aspects, the results suggest that the existing process does not contribute significantly to the increase in the livestock population.

4.6 Impact of Input on Livestock income through Process

Mediation analysis indicates that input variables do not significantly influence livestock income through the existing process (path coefficient = 0.115, probability = 0.573 > 0.05). This suggests that the impact of input variables on livestock income cannot be entirely explained by the current process.

4.7 Impact of Input Livestock Population through the Process

The results of mediation analysis show that input variables do not significantly influence the livestock population through the existing process (path coefficient = 0.072, probability = 0.706 > 0.05). In other words, the influence of input variables on the livestock population cannot be fully explained by the current process.

5. CONCLUSION

The government's livestock assistance program in Kabupaten Humbang Hasundutan has demonstrated positive impacts on both livestock income and population. However, the effectiveness of the program is nuanced. While input variables play a crucial role in influencing both livestock income and population, the process variables, despite encompassing various elements, do not significantly contribute to these outcomes.

The findings underscore the importance of refining the program implementation by focusing on factors such as aid selection, training, accuracy, and timing. Additionally, efforts should be directed toward empowering livestock farmers with the necessary skills and knowledge. Further research and program adjustments may be needed to address the nuances identified in the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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