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[Novie Andri Setianto, Donald Cameron, John B. Gaughan. "Identifying Archetypes of an Enhanced System Dynamics Causal Loop Diagram in Pursuit of Strategies to Improve Smallholder Beef Farming in Java, Indonesia", Systems Research and Behavioral Science, 2014](#)

[IOP Conference Series: Earth and Environmental Science PAPER • OPEN ACCESS](#) Unintended Effect of Government Program on Beef Development in Indonesia; A System Approach [To cite this article: N A Setianto et al 2019 IOP Conf. Ser.: Earth Environ. Sci. 372 012003](#) [View the article online for updates and enhancements.](#) This content was downloaded from IP address 36. 80.115.53 on 14/05/2020 at 03:22 [Unintended Effect of Government Program on Beef Development in Indonesia; A System Approach N A Setianto, N N Hidayat, P Yuwono, M Sugiarto, K Muatip and R Widiyanti Faculty of Animal Science, Jenderal Soedirman University, Jl. Dr. Suparno 60 Karangwangkal,](#)

[Purwokerto, Indonesia](#) E-mail: novie.setianto@unsoed.ac.id [Abstract. The study aimed to](#) identify and analyse [the effect of](#) government program on beef development. The participants of the research were 50 farmers of beef farming [in two farmers group in Kabupaten Banjarnegara, Central Java](#). A series of direct observation combined with semi-structured interviews and workshops have been carried out to capture the everyday activity of the beef farming and to highlight the potential driven factors affecting the performance of the farming. Descriptive statistics was used to analyse the farming activities, the resources affected and affecting the grant, and pressures which drove farmers to get the government grant. Then, a qualitative model was drawn using Vensim® software. Lastly, a stock and flow dynamic modelling was performed using iThink® software. The model showed several common systems loops as the findings. One of the highlighted was the double effect of government grant to the systems performance. Initial [design of the government program](#) was [to increase the](#) sufficiency of national beef stock by importing cattle. However, model showed that it also had unintended consequences to increase farmers' expectation to get easy instant cash. Keywords: qualitative modelling, causal loop diagram, stock and flow, dynamic model, beef farming

1. [Introduction One of the](#) highlighted livestock [development in Indonesia is](#) national beef sufficiency. Numbers of design and program have been promoted to boost the cattle population. However, the nation's keeps on importing beef. [Most of the beef farmers in](#) Indonesia [are smallholders](#) [1], therefore beef development program should focus on smallholders particularly in rural area. Smallholders are complex, in which many farmers have multifaceted roles with varying objectives and interest [2]. Dealing with such a complex systems demanded an approach which are sensitive to complexity as well as have capability to visualize [the complexity of the system](#) [3-5] [and](#) translate [the complexity](#) to an understandable diagram [6,7]. A study has been undertaking for three years to develop a step by step protocol on systems analysis [of smallholder beef farming](#) systems [in rural Java](#). One of [its](#) objectives was to analyse the influence of government grant to smallholder beef farming productivity. Similar to other government grant, it always have unintended effect [8]. This article aimed to highlight the [unintended effect of government](#) grant [on beef](#) farming [in Rural Java, Indonesia](#). [Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author\(s\) and the title of the work, journal citation and DOI. Published under licence by IOP Publishing Ltd 1 2. Methodology](#). A mixed method [9] of qualitative and quantitative approach was applied in this research. Qualitative method was used to capture the systematic interactions among three elements within a beef farming system. Those three elements include; (i) the activities which describe common daily activities of the beef farmers (ii) the resources which shows the identified resources affected and affecting the activities, and (iii) the pressures which include any other variables drove farmers to do beef farming. Participatory approach was carried out by conducting focus group discussion to identify all of those three elements. Discussion should be facilitated to be focused only on the identification of the activities, resources and pressures. Once identified, then participants were asked to discover the direct interactions within and among elements. The next step was develop the qualitative model describing all elements and interaction to investigate and highlight the common pattern. A modelling software, Vensim which developed by Ventana was used to develop [the Causal Loop Diagram \(CLD\) to](#) show [the](#) qualitative model [of](#) beef farming system. Outputs of the CLD were loops which describe all the linkages within the beef farming system. The quantitative model developed based on systems dynamic stock and flow model [4,10] using iThink® software. It was started by building the structures of the dynamic model based on the CLD loops. The last process was data mining using interview and secondary data collection.

3. Result and Discussion Numbers of development program to increase cattle population have been introduced in the last decades. One of the program was what so called Sarjana Membangun Desa (SMD) [11]. This program was specifically designed both to improve farming productivity and income by elaborating fresh university graduates to assist local farmers group. (DGLVS). In a broader perspective, the program was aimed to increase the number of cattle population in national level. However, based on the fact that Indonesia keeps on importing live cattle indicates that the SMD program was not entirely successful. Systems complexity need to be comprehended to assist the successfulness of an intervention program [12]. Beef farming is complex systems [13,14], particularly smallholders which mostly plays multi roles in an agricultural systems. System thinking approach used in this research is able to identify multiple causal feedback loops existed in a beef farming systems as [shown in Figure 1. Figure 1. Qualitative model of](#) beef farming systems under government grant (a) and its impact (b) Figure 1 showed that the government grant program has a direct impact on increasing the group capital which will trigger the loop R3 as the engine of growth of the farming performance. R3 loop highlights that more capital from the grant used to purchase more cattle both for fattening and breeding purposes. More cattle population means more sales which creates more revenue and more power to increase group capital, and the loop continues. However, it also has unintended impact. Immediate significant cash inflow also encourages [farmers to earn more income which](#) increase their expected income. Increase in expected income triggers B1 loop which widens [the gap between](#) the [actual income](#) and [the](#) expected [income](#). [As](#) a result, farmers tend to allocate more of their income from cattle sales to their individual [income as an effort to close the](#) income [gap](#), rather than reinvest the earning to purchase more cattle. Further, the widen [gap between expected and actual income](#) persuades [farmers'](#) desire to sell [more](#) cattle as an attempt to close the income gap (showed by B3 loop). Figure 2. Quantitative model of motivation and control of beef farming system In addition, Figure 1 showed that the grant has influence on leader power. In a smallholder farmers group, leader has a strong position to balance the need for group as well as farmers household survival. This [can only be achieved if the leader](#) earned respect [and](#) trust from the [group](#) member [15,16]. The ability of leader to bring the group as the grant recipients prompts the R4 loop. This loop is a reinforcing loop which could be a vicious or virtuous loop. Positive sentiment on leader power through the linkages showed in Figure 1b strengthen member trust which further increase leader power. Strong leadership helps groups to proportionally allocate income both for group and member as individuals. To sum up, the CLD highlights that government grant has unintended effect in two dimensions. First, the motivation dimension which driven by the widen [gap between the expected and actual income](#). [The](#) motivation of the group mainly focus on the individuals pursuing their own interest, which is closing the gap by put more income allocation to farmers portion and increasing desire to sell more cattle. Second, the control dimension which shows the importance of leader power to ensure the group sustainability as the balancing feedback loop of the motivation behaviour. For further analysis, a quantitative model was developed (Figure 2). Figure 2 is the translation of the previous CLD qualitative model. The model showed the [effect of revenue on leader power to share revenue](#). It was scaled from 0 (zero) which means leader has no power, and 1 (one) refers to total power of the leader. Output of the model confirmed how the leader power has a significant effect on allocating rational portion between group and individuals to ensure group performance (Figure 3). 1: 1: group capital 200 2: farmers income 2: 20 1: 2: 100 10 2 1 2 1 2 1 2: 0 0 1 Page 1 0. 00 30.00 Months 60.00 90.00 10:01 PM Thu, 25 Jul 2019 120.00 Group Capital dan Farmers Income Figure 3. Model Output; Group Capital and Farmers Income Figure 3 showed that control by leader could influence the proportion of income allocation between group and farmers so that both could earn rationally portion to ensure beef farming sustainability.

4. Conclusion Government grant brings unintended effect to the beef farming systems in motivation and control dimension. In motivation dimension, it increase expected income and desired to sell more cattle, whereas in control dimension it strengthen group leader's power which has control on allocating group resources. Models highlight the importance of leader power to the sustainability of a smallholder's farmer group. Further research on the dynamic of the leader power is