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The strategy in increasing participation of female farmers to actualize household's food security in East Lombok, West Nusa Tenggara Province

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Abstract. This study aims to analyze the factors that influence the ability, participation of female farmers, household food security status, and formulate a strategy to increase the participation of female farmers to achieve household food security. This research applies survey methods in four villages from two sub-districts that have the most farmer households and are classified as food insecure in East Lombok Regency with a total of 300 female respondents. The analysis used is Structural Equation Modeling (SEM). The results of the SEM analysis explain that the factors that influence: 1) the ability level is the support of the provision of extension, access to resources, and the support of the socio-cultural environment of the community; 2) the level of participation is household socio-economic, access to resources, abilities, and personal characteristics; 3) household food security status is a personal characteristic, ability, and access to resources. Strategies for increasing the participation of female farmer in achieving household food security are increasing the ability of female farmers, increasing support for conducting education, increasing access to information, enhancing the quality of personal characteristics, enhancing household socioeconomic characteristics, strengthening supporting socio-cultural environment, and conditions ideal participation for female farmers.

1. Introduction

Female farmers play an important role in sustaining food security of households. They tend to do important jobs in producing staple foods[1]. Female farmers are also responsible for doing planning, processing, preparing, thus in serving food for their family [2] They are exclusively responsible for their family's nutrients [3]. On the other hand, female farmers are also using their income to buy food they didn't produce[3-5].

The International Centre for Research on Women/ICRW stated that female farmers are included in an integral part in alleviating poverty and malnutrition, too. They also do the coping ability indicator to fulfill the needs of their family nutrient [2-4,6-8].

Female farmers' participation is not only related to increasing food production and food serving but to also increase the nutrition of its household members. This supports a statement that a household's food security is the ability of a household to fulfill their needs for that will impact their healthiness, which mirrored at their consumed nutrients [9,10].



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Hence, as the ultimate role, female farmers are ideally seen as an active member of the community, consider as initiator, also have the willingness and the needed ability to achieve the food security [11]. The participation of female farmers in Lombok Timur has not been optimized to embody its food security, especially to fulfill their family's nutritional needs[12]. They should be supported, such as technically, managing, and socially. It has the potential to be leveled up, so the number of participants could also be optimized to sustain food security. This is linear to [13,14], which stated that the ability in technical, management and social engagement could optimize their potential and also increasing their skills in farming.

As referred to [15] opinion, to increase the potential skill on female farmers due to achieve food security, changing behavioral on female farmers in East Lombok is necessary to do, at such availability, access and benefit components.

Besides, causes for the unoptimized female farmers' participant and their causes of ability weakness can be included in several factors. First, it is their personal characteristics, which is age [16], business experience [17], lack of education [4,18], lack of motivation, and self-confidence [18,19], a number of a family member [4], non-formal education or extension or training [3,4,20]. Second, the social-economy condition of household which consists of: land area [16,21–23], income [3,6,16,23], decision making in the household [3,4,20].

Third, socio-cultural support from the surrounding, which depicted on: family's support, community's support, community leaders' support, cultural value. Fourth, access to resources, which are access to farmer's land, bank loan, agricultural production facilities, access to efficient technology, and access to the market. Fifth, support from an eligible extension, which concerned with female farmers' perspective toward its implementation, consists of material, methods and media, time and place, extension agent's behavior, extension's intensity, and competency.

Based on the previous study, the question of its recent study must be answered: "Why is the level of participation and skills on female farmers not yet been optimize to achieve the food security in households and how to boost those criteria so it can reach the expected goal?"

Based on the problem formulation of this study, the objectives of this study are: analyzing the factors that influence the ability and participation of women farmers in achieving household food security, analyzing the factors that affect household food security status, and formulating strategies to increase the participation of women farmers in realizing food security household.

2. Methods

Energy consumption level (TKE) data is collected through 24 hours recall method (Chung et al. 1997 in Hayati 2014). The depth-interview result and FGD are also being done to support the needed data. The primary data then scored and transformed into a scale 0-100. Transformed data then categorized into three classes: (1) low (score of 0-33.3); (2) middle (score of 33.4-66.7); (3) high (score of 66.8-100). Energy household data was taken to be processed and grouped into three categories of food security: (1) very prone (TKE < 70%); (2) prone (TKE 70-90%); (3) secured (TKE > 90%). Structural Equation Model (SEM) analysis then used to see the relationship between the research variable and find the linkage of research variables and supported factors in the empirical model. Hypothetical framework of the research variable's structural model can be seen in Figure 1.

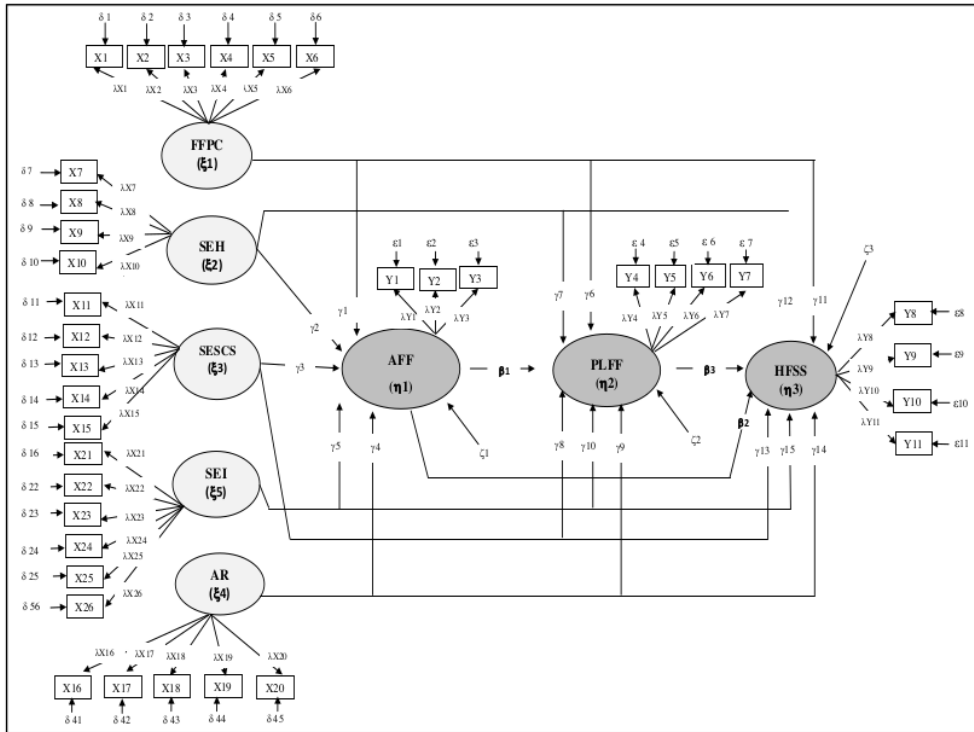


Figure 1. Hypothetical framework of the research variable's structural model.

The types of research data include: (1) the personal characteristics of female farmers; (2) household socio-economic; (3) socio-cultural environment support; (4) access to resources; (5) support for organizing extension; (6) the level of ability of female farmers; (7) the level of participation of female farmers; and (7) household food security status is obtained through interviews with respondents using a closed questionnaire based on a Likert scale and open-ended questions. Variables that symbolized in Figure 1 is explained as follow:

- | | |
|---|---------------------------------------|
| FFPC = Female farmers personal characteristic | X12 = Society support |
| SHE = Social-economy of household | X13 = Supportive society figure |
| SESCC = Supportive environment of socio-cultural society | X14 = Cultural value |
| SEI = Supportive extension implementation | X16 = Access to land |
| AR = Access to resources | X15 = Gender equality |
| AFF = Ability of female farmers | X17 = Access to loan |
| PLFF = Participation level of female farmers | X18 = Access to production facilities |
| HFSS = Household food security status | X19 = Access to efficient technology |
| Λ = Lamda, loading factor which symbolized relationship between the exogenous latent variable and endogenous variable with its indicators | X20 = Access to information |
| δ = Delta, measurement error from exogenous variable indicator | X21 = Access to the market |
| E = Eta, measurement error from | X22 = Material |

endogenous variable indicator

- | | | | |
|----------|---|-----|----------------------------------|
| γ | = Gamma, standardized exogenous variable coefficient toward the endogenous variable | X23 | = Method and media |
| β | = Beta, standardized endogenous variable coefficient toward the exogenous variable | X24 | = Instructor's behavior |
| ζ | = Zeta, structural error on endogenous variable | X25 | = Extension's intensity |
| X1 | = Age | X26 | = Instructor's competencies |
| X2 | = Formal education | Y1 | = Technical ability |
| X3 | = Non-formal education | Y2 | = Social ability |
| X4 | = Work experience | Y3 | = Management ability |
| X5 | = Amount of family member | Y4 | = Planning |
| X6 | = Motivation | Y5 | = Implementation |
| X7 | = Land area | Y6 | = Benefits acquisition |
| X8 | = Household income | Y7 | = Evaluation |
| X9 | = Female's income | Y8 | = Food availability |
| X10 | = Decision maker in household | Y9 | = Food access |
| X11 | = Family support | Y10 | = Food utilization |
| | | Y11 | = Energy consumption level (TKE) |

Based on the hypothetical framework of research variable's structural model, the structural equation for this study then found as follow:

$$\eta_1 = \gamma_1\xi_1 + \gamma_2\xi_2 + \gamma_3\xi_3 + \gamma_4\xi_4 + \gamma_5\xi_5 + \zeta_1 \dots \dots \dots (1)$$

$$\eta_2 = \gamma_1\xi_1 + \gamma_2\xi_2 + \gamma_3\xi_3 + \gamma_4\xi_4 + \gamma_5\xi_5 + \beta_1\eta_1 + \zeta_2 \dots \dots \dots (2)$$

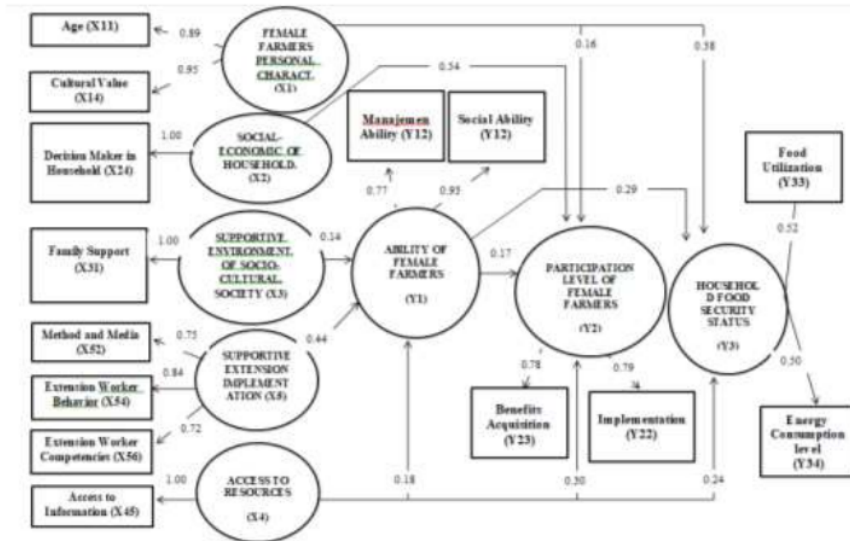
$$\eta_3 = \gamma_1\xi_1 + \gamma_2\xi_2 + \gamma_3\xi_3 + \gamma_4\xi_4 + \gamma_5\xi_5 + \beta_1\eta_1 + \beta_2\eta_2 + \zeta_3 \dots \dots \dots (4)$$

with its test criteria using eight Goodness of Fit Statistics measures, there are $GFI \geq 0.90$, $CFI \geq 0.90$, $NFI \geq 0.90$, $NNFI \geq 0.90$, $RMSEA \leq 0.08$, $AGFI \geq 0.90$, $RFI \geq 0.90$, $IFI \geq 0.90$.

3. Results and Discussion

3.1. Analysis of dominant factors that affecting female farmers ability, participation, and the status of food security household

The fit of goodness model result shows that the *acord* hybrid model (Figure 2) already fit with seven measurements that had shown, which are $GFI=0.96$, $CFI=0.99$, $NFI=0.97$, $NNFI=0.98$, $RMSEA=0.043$, $AGFI=0.92$, $RFI=0.95$, $IFI=0.99$, so the model is considered worth to predict population. The model shows that there is an influence among the direct variables and indirect variables, where it can be identified through decomposition influence between used variables (Bollen 1947 in Kusnendi 2008).



Chi-Square=87,96, df=57, P-value=0,00529, RMSEA=0,043, CFI=0,99, AGFI=0,92

Figure 2. Parameter of hybrid model estimation to increase ability and participation of female farmers to achieve household food security.

3.2. Factors that affect female farmers ability to support household food security

Female farmers' ability positively and significantly affected by the supportive environment of socio-cultural, access to resources, and supportive extension implementation (Figure 2) with structural equation model: $Y1 = 0.14 \cdot X3 + 0.18 \cdot X4 + 0.44 \cdot X5$, with $R^2 = 0.44$. Altogether they influenced as well as 44% towards female farmers' ability. Meanwhile, the rest (56%) affected by other factors outside the model. This research explains that at the first hypothesis, three proven variables positively impact female farmers' ability to support household food security, which is supportive extension implementation, access to resources, and supportive socio-culture.

Supportive extension implementation is very needed by female farmers so that behavior changes can happen and increase female farmers' ability to support household food security. Indicator that formed supportive variables for extension implementation that influence female farmers' ability is: extension attitudes in line with, method and media are in line with [15,24], and extension competition that in line with [18]. It means that the more positive extension attitudes become, the higher suitability of the method and media become, and extension competition then the higher female farmers' ability to support household food security.

Indicator that formed female farmers' access variable toward resources that effect on female farmers' ability to information. It means that female farmers' ability is very strong reflected by female farmers' access to related information with aspects of household security. The higher female farmers' access toward information, the higher female farmers' ability to become. Ruben (1988) said that information and messages are very important to build a relationship between people and interact with social life. Information search can be done by continuous communication as an effort to build a good network both formally and non-formally.

Indicator that formed a supportive socio-culture environment that affects female farmers' ability is family support in line with [3,25,26]. It means female farmers' ability reflected by family support. The higher family support in giving guidance and direction related availability aspect, access, and food utilization also supports females farmers to follow extension activities regarding those things so than the higher female farmers' ability to support household food security. Therefore, husband and other household members must have an awareness of the importance of achieving household food security, have the right understanding about food distribution, choose the type of food consumed, and the supply of nutritious food and its benefits for the health and growth of children.

3.3. Factors that affect female farmers' participation in achieve household food security

Female farmers' participation in achieve household food security affected positively and significantly by ability, personal characteristics, household socio-culture, access to resources with structural equation model: $Y_2 = 0.17*Y_1 + 0.16*X_1 + 0.54*X_2 + 0.30*X_4$, with $R^2 = 0.65$. Together, they affect 65 percent of female farmers, the rest (35 percent) affected by other factors outside the model.

The result of this research shown that the second hypothesis, a proven variable that positively affected female farmers' participation in achieves household food security, which is female farmers' characteristics, household socio-economy, access to resources, and female farmers' ability.

Other factors, that give influence toward female farmers' participation in achieving household food security indirectly are supportive extension implementation, access to information, and family support. Supportive extension implementation, access to information, and family support affected female farmers participation in achieving household food security through its contribution toward female farmers' ability. It means the higher those three factors give contribution toward increasing female farmers' then it will further increase the participation of female farmers in achieve household food security.

This result shows that the importance of utilizing the potential of household socio-economy factor, increasing female farmers' access toward resources, increasing female farmers' ability, then utilizing the potential of female farmers' characteristics. Indicator that formed household socio-economy variable that affect on female farmers' participation in decision making in households. This is in line with [3,4,20]. It means female farmers' participation reflected by decision making in households. The high role of female farmers in decision making in household the the participation is also high in achieving household food security.

Indicator that formed female farmers' access variables toward resources that affect female farmers' participation is access to information. This is in line with [3,27]. It gives a meaning that female farmers' participation is very strongly reflected by female farmers' access to related information with household security components. The higher female farmers access to information, the higher the participation of female farmers in achieving household food security. Therefore, increasing female farmers' access to related information with household security is a necessity.

The indicator that formed ability access that effect female farmers participation is social ability and managerial ability, it means that female farmers participation is very strong reflected by social ability and managerial ability. The higher social and managerial ability gets, the higher the participation of female farmers in achieving household food security. Female farmers' social ability related to having chance to involved in a group or become a member or administrator of a group, having an experience of work together in a group, interacting with group members, learning together in a group related as an effort to achieve household food security. Female's managerial ability related in doing management activities like planning, directing, supervision, and evaluation. All this time, they were doing it in a very simple way or as is based on habits and knowledge.

The indicator that formed female farmers characteristics that affect on female farmers participation are age and experience, which means that female farmers participation reflected by female farmers business age and experience. The higher business age and experience, the higher the participation to achieve household food security. Female farmers who are young at large have an experience that is lower than the lower the participation to achieve household food security comparing to female farmers who are older. Therefore, female farmers business age and experience must be considered in increasing the participation of female farmers in achieving household food security.

3.4. Factors that affect household security status

This research found that household food security status reflected by household food utilizing and energy status component (TKE). It gives meaning that household food utilizing and energy status (TKE) component is the main reference from household food security status. Food utilizing component determined by good household food quality, which is a household that can consume side

dishes that contains animal protein and plant-based or only animal every day. [9,28] confirms that enough food measure is indicated by energy consumption that fulfills the needs to do some activities and live a healthy life based on minimal life standard.

Household food security status positively and significantly affected by ability variable, female farmers characteristic, access to resources with this structural equation: $Y3 = 0.29*Y1 + 0.38*X1 + 0.24*X4$, $R^2 = 0.37$. Together, the ability variable, female farmers characteristic, and access to resources affect household food security status 37 percent, the rest (63 percent) affected by another factor outside the model.

Research findings show there are three free variables that have a significant effect on household food security status, which is female farmers' characteristic, access to resources, and female farmers' ability. Therefore, the third hypothesis is not all accepted. Factor gives an indirect effect on household food security but through ability variable, which is supportive extension implementation, supportive socio-culture society environment, and also female farmers' access toward resources.

Indicator that formed female farmers' personal characteristics that affect household food security is age and experience. This is because female farmers who are older have more experience than younger ones. Actually, households that are food resistant, mainly households that can consume a quality food does not look at female farmers' age and experience. Therefore, female farmers' business age and experience must be considered in achieving household food security status.

Indicator that formed the ability variable that affects on household food security status is social ability and managerial ability. It gives the meaning that the higher social and managerial ability gets, the higher household food security gets. Female farmers that have a high social ability are female farmers that capable of build and have a relationship with other people collectively as well as individually. Female farmers will gain knowledge related to household food security components, mainly food utilization and TKE component. Other than that, group existence can also be optimized by extension agents. Female farmers that have a high managerial ability are female farmers that capable of doing management activities like planning, directing, supervision, and evaluation related to food security components, mainly food utilization and TKE component. Therefore, in order for households to become secure food household, female farmers' managerial ability needs to be fixed and improved.

The indicator that formed female farmers access variables toward resources that affect households food security status is access to information. It means the higher female farmers' access gets, the higher household food security status. Therefore, female farmers' access toward related information with household food security, as well as in the existence of component, access, and food utilization, must be improved because it is a necessity. Female farmers that have high access to information, specially related on food utilization component the importance of TKE that fulfill an active and healthy life standard so then female farmers will realize that consuming quality food and fulfill TKE standar necessity as needed is very important and useful in order to live a healthy and active life.

Indirectly, supportive extension implementation, access to information, and family support affect households food security through its contribution to the level of female farmers' ability. It means, the higher those three factors give contribution to improving female farmers' ability, so it will further improve the participation of female farmers in achieving households food security. Therefore, the achievement of households food security is not only the responsibility of female farmers. But also need a supportive extension implementation, mainly husbands. Husbands should have the same awareness and understanding with female farmers about the importance of fulfilling a quality food consumption and fulfilling TKE according to normal necessity standards for all the households' members.

Expected impact of the participation of female farmers is achievement of households food security. This research findings, statistically female farmers' participation dependent variable does not give a positive and significant affect on households food security (Figure 2). It means, the higher the participation of female farmers does not cause achievement of households food security. This indicates there are problems faced by female farmers for their participation in achieving households food

security. This research supported by [29] that said in the process of development, in fact, it is not always linear, and the results can not always be predicted correctly because of there many factors that affect outcomes.

These research findings show that the participation on the implementation stage is higher than the benefit acquisition stage. It means the participation of female farmers on implementation stage does not cause female farmers and households' members to obtain an optimal benefit. The fact shows that benefit acquisition that accepted female farmers and households members on food utilization component are still lower than the benefit that accepted by female farmers on the existence aspect and food aspect. Availability of animal food security in the market but not bought or available in the home yard (for example, chicken and freshwater fish) but not consumed but sold to fulfill other food material or fulfill daily needs.

3.5. Participation improvement strategy of female farmers in achieving household food security

Participation improvement's strategy of female farmers in achieving households food security formulated based on the proven theoretical model through SEM analysis with software LISREL 8.70 (Figure 2). However, based on the result of in-depth interview and FGD, found things that are considered very important, although not tested through SEM analysis, also put into strategy and pushed to be strengthened and improved so the participation of female farmers become ideal or optimal to achieve household food security. Therefore, participate improvement strategy of female farmers in achieving households food security is done through:

3.5.1. Strengthened female farmers' ability. Strengthened female farmers' ability can be done by government (PNS extension), private sector, universities, and other information sources.

- a. Increased social ability is done by formed and strengthened existence group (farmers group, female farmers group, PKK, Integrated Healthcare Center, "Banjar") as learning media and work together by instructor and strategic service.
- b. Increased managerial ability needs to be done so female farmers be able to manage households food security activities with better management.
- c. Increased technical ability needs to be done so female farmers be able to provide, prepare, and distribute nutritious and variety of food.

3.5.2. Strengthened indicators that reflect supportive extension implementation, which are:

- d. Increased genders' awareness and sensitivity and changing behavior of instructor to be more empathetic to women.
- e. Increased instructors' ability in preparation and use of method and media according to female farmers' needs
- f. Increased instructors' competence, which are basic competence, main competence, and special competence related to household food security aspects.
- g. Increased instructors' understanding and mastery related food utilization material aspect mainly concerning distribution aspect and food consumption also nutrition.

3.5.3. Strengthened indicator that reflect access toward information resources.

- h. Increased female farmers access toward information can be done through increased information resources that are easy to access by female farmers and also other society and material according to female farmers and society needs, information resources which are mass media (print media like leaflet, posters, radio broadcast, television streaming);
- i. Increased female access toward information using group approach which are PKK empowerment, integrated healthcare center, "Banjar", PKK/Integrated Healthcare Center, and personal approach which is through the role of a society figure, religion figure/"Tuan Guru," instructor, member of integrated healthcare center

3.5.4. Strengthened indicator that reflect female farmers personal characteristic (business age and experience). Increased female farmers' participation, which are business age and experience.

Business age and experience can not be improved because it will increase by itself over time. Effort that can be done is the use of age at a young age. Therefore, awareness effort can be made through the role of a society figure, religion figure/"tuan guru", instructor, administrator and member of PKK and "Banjar", integrated healthcare center member, and parents by giving examples of behavior and direction to female farmers and their husband, and also teenage boys and girls.

3.5.5. Strengthened socio-economy indicator of households which is decision making by female farmers in households that are directed to the importance of making decision in existence resources utilization (for example chickens and fishes) to fulfill animal protein needs for all the households, using and allocating households' income to buy and provide side dish to all the household member according to their needs so they obtain food that not only fulfilled by quantity but also quality. Strengthened decision making can be done through the role of society figures, religion figure/"Tuan Guru", instructor, PKK/integrated healthcare center by giving examples of behavior and giving direction or guidance to female farmers and their husbands.

3.5.6. Strengthened indicator that reflect supportive socio-culture society environment (family). Family support in this thing is a husband to give chances toward female farmers attend extension, and giving guidance to female farmers related to food consumption that is very needed. Therefore, not only female farmers as a wife who improved in their awareness and understanding of its importance and benefit, especially about food utilization component which is reflected by the quantity and quality of households food consumption, but also husband as partner of female farmers, children, teenager, and also society.

3.5.7. Strengthened participation of female farmers. Participation of female farmers nowadays not ideal yet because it reflected by the implementation stage and benefit acquisition and has not shown is participation's effect on this household food security status. Therefore, it needed to improve the participation of whole female farmers, start with the planning stage, implementation, benefits acquisition, and evaluation. So that increased the participation of female farmers can improve household food security status is achievement households that are food resistant. All the household member can accept quality food and can live an active and healthy life.

4. Conclusion and recommendation

4.1. Conclusion

- Factor which affects to level up skill is supported extension implementation to resources and socio-cultural environment.
- Factor which affects the number of participants is household's social-economics, access to resources, skills, and personal characteristics.
- Factor which affects the food security status is the personal characteristics, skills, and access to resources.
- Strategy to boost up female farmers' participation to achieve food security on the household is increasing their ability as a farmer, increasing support for the extensive program, increasing accessible information, enhancing the quality of female's personal characteristics, enhancing household socioeconomic characteristics, strengthening supporting socio-cultural environment, and ideal conditioning for female farmers' participation.

4.2. Recommendation

To increase the number of participants due to achieve food security in the household, involved parties, such as female farmers as the main actor and their husband as supporting role, instructor and strategic servant, government, university, and other information resources, also the private sector.

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