Local Regulation as a Nutritional Improvement Solution: Case Study of Moringa Program in West Sumbawa

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Summary The monitoring of the nutritional status in 2017 showed that the percentage of underweight in West Sumbawa was 20.8%—higher than national (17.8%). In 2016, Pencerah Nusantara, a program that strengthen primary health care through youth empowerment and interprofessional collaboration, encouraged the use of moringa as local food ingredient to improve the nutritional status of children at Poto Tano Health Center, West Sumbawa District. Moringa Program is an innovation program to educate community about nutrition and provide moringa-based foods to improve community nutrition. This program was then implemented not only at one health center but in all sub-districts. Furthermore, BAPPEDA (Local Development Planning Agency) included moringa program to Local Nutrition Action Plans as stipulated in the District Regulation No. 80/2017 about preservation of moringa. This study aims to describe the impact of local regulation on the development of moringa program as one of the solutions to overcome the nutritional problems of children under five. The study uses a case study design on community readiness assessment and is complemented by secondary data collection. The study shows clearly that the regulation is the key factor in strengthening cross-sector partnership and in maximizing efforts to improve community nutrition through the Moringa Program. During the implementation of providing moringa-based foods as a provision of supplementary feeding and complementary feeding at integrates health posts (Posyandu), there was a decrease in cases of underweight in children under five at the Poto Tano Health Center from 21.9% in 2017 to 19.9% in 2018.

Key Words moringa, local food, nutrition, regulation

Undernutrition remains one of the most common causes of morbidity and mortality among children under five in developing countries (1). In addition to its pronounced effects on morbidity and mortality, undernutrition has documented effects on cognitive development, educational outcomes, work capacity, and gross domestic product (2). In 2011, 16% of children under five were underweight (low weight-for-age) in developing countries and 45% of under-five deaths were directly or indirectly linked to undernutrition (3). Despite global improvements, the prevalence of underweight among children under five is still a major public health problem in Indonesia. The monitoring of the nutritional status in 2017 showed that the percentage of underweight in Indonesia was 17.8%—higher than global figure 13.5% (4, 5).

West Sumbawa has Moringa (Moringa oleifera) as a potential nutritious food. Moringa can withstand both severe drought and mild frost conditions and hence widely cultivated across the world. Moringa is rich in nutrition owing to the presence of a variety of essential phytochemicals present in its leaves, pods and seeds. In fact, 100 mg of dried moringa is said to provide 7 times more vitamin C than oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk, 9 times more protein than yoghurt, 15 times more potassium than bananas and 25 times more iron than spinach (Table 1) (2). The fact that moringa is easily cultivable makes it a sustainable remedy for malnutrition. Countries like Senegal and Benin used leaves of moringa as powder at health facilities to treat moderate malnutrition (7) Since 2016, mainstreaming Moringa as nutritious local food had been used as an entry point for community nutrition improvement programs in Puskesmas. Moringa was used in the supplementary food program (PMT penyuluhan) in Posyandu (Integrated Health Post where monthly growth monitoring program was

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However, this program still does not have a significant impact in reducing the prevalence of undernutrition, even though moringa is a very abundant local food ingredient in Pototano.

Based on the results of the Program Sustainability Assessment (PSA) during 2016 to 2019, it is known that the support of the surrounding environment is still very low, as well as the partnership that exists. This has an impact on the lack of funding sources which is one of the supporting factors for the success of the program. Therefore, an innovation is needed to improve the quality of the moringa program in Puskesmas so that it can reduce undernutrition rates. This paper aim to describe the impact of local regulation on the development of moringa programs as one solution to overcome the nutritional problems of children under five.

**MATERIALS AND METHODS**

The study used a case study design based on primary and secondary data from Pencerah Nusantara Program in Poto Tano Health Center, West Sumbawa during 2016 to 2019 and complemented by a review of well-evidenced literature.

Primary data was collected using 2 various assessment toolkits, including:

1. **Community Readiness Assessment (CRA)**

   CRA conducted using semi-structured interviews. The community’s key informants were identified using purposive and snowball sampling and consisted of: 1) Project Owners (Nutritional Programmer of Pototano Health Center); 2) Direct Partners (West Sumbawa District Health Office, Sub-District Government, Local Government Agencies, etc); and 3) Project Beneficiaries (Local Leader, Community Health Worker, etc) based on stakeholder analysis results.

   The interviews addressed 6 issues, consisted of: 1) the community’s efforts; 2) community knowledge of the efforts; 3) leadership; 4) community climate; 5) community knowledge of the nutritional problems at Pototano District; and 6) resources available to support Moringa Program.

   The interviews were transcribed verbatim and were firstly analysed thematically and then scored using the assessment guidelines produced by the Community Readiness Model (CRM) authors. There are six stages on the CRA as shown in Fig. 1 (8).

2. **Program Sustainability Assessment (PSA)**

   PSA was made up of 40 self-assessment questions to evaluate the sustainability capacity of a nutrition program in Poto Tano Health Center using likert scale of 1 to 5, shown in Table 2.

   These questions addressed 8 domains, including 1) Environmental Support; 2) Partnerships; 3) Funding Stability; 4) Organizational Capacity; 5) Strategic Planning; 6) Program Evaluation; 7) Program Adaptation; 8) Communications.

   These self-assessments were taken as a group consisted of nutrition staff and related stakeholders to collect many perspectives about program.

   Secondary data has been obtained from Poto Tano Health Center’s documents during 2016 to 2018, including quarterly progress report, the results of Minimum Standards of Services or Standar Pelayanan Minimum (SPM), annual report or health profile, and unpublished documents as well as published reports from these sources to identify the prevalence of underweight.

   A comprehensive scientific literature review has also been undertaken regarding nutritional problems, policies, and action plans at sub-district and/or district level and local food for improving nutrition of the community.

**Table 1.** Comparison of the nutritional of moringa with other food.

| Content    | Moringa     | Other food    |
|------------|-------------|---------------|
| Vitamin A  | 6,780 mg    | Caroot 1,890 mg |
| Vitamin C  | 220 mg      | Orange 30 mg  |
| Calcium    | 440 mg      | Cow milk 120 mg |
| Potassium  | 259 mg      | Banana 88 mg  |
| Protein    | 6.6 g       | Cow milk 3.2 g |

**Table 2.** Score of Potential Sustainability Assessment (PSA).

| Interval of Average Score | Score | Category |
|--------------------------|-------|----------|
| 1.0–1.8                  | 1     | Bad      |
| >1.8–2.6                 | 2     | Poor     |
| >2.6–3.4                 | 3     | Enough   |
| >3.4–4.2                 | 4     | Good     |
| >4.2–5.0                 | 5     | Very Good|

![Fig. 1. Stage of Community Readiness.](image-url)
tors of predisposing, enabling, and reinforcing. According to Green (Table 3) there are several common elements related to behavioral science (10).

1) Behavior, especially in its more complex lifestyles manifestations, accounts for a much larger proportion of the total mortality and morbidity of most societies than is reflected in the allocation of resources to modify or develop health behavior.

2) Effective programs to modify or develop health behavior in populations must include some combination of health education and organizational, economic, and environmental supports for the behavior.

3) Policies addressing health behavior cannot be made a substitute for the provision of basic, primary health care services or regulation of health services and environment health policy can support health behavior at the same time that they are directly addressing health through biomedical and environmental interventions.

RESULTS

1. Community readiness to address public health problems in Poto Tano Sub-District

In addition to analyzing health problems, an analysis of the potential of the health program (Potential Sustainability Assessment) and community readiness (Community Readiness Assessment) is carried out on health issues and efforts.

CRA results in 2016 indicate that the community is in the pre-planning stage (Table 4). The meaning of this stage is that the community has an awareness that something must be done in regard to nutritional problems and there are groups that try to overcome it even though the efforts made are not focused/detailed.

Based on the results of the CRA, a follow-up action should be considered is to provide ideas to the community regarding health programs that can be carried out and in accordance with the problems and potential they have.

2. Moringa program as a solution to address nutritional problem in Poto Tano Sub-District

Based on the results of the analysis of the health situ-
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Pencerah Nusantara with the Poto Tano Health Center introduce the idea to the health cadre of the Poto Tano Sub district called the Moringa Program. Due to limited funds, the moringa program can only be disseminated to a number of villages and is limited to making moringa pudding.

3. Develop Moringa Program through predisposing, enabling, and reinforcing factors approach

The moringa program was developed using the Lawrence Green theory approach (Table 3), which intervened in three important elements, namely strengthening human resources (Puskesmas and cadre) in the form of training in making PMT penyuluhan (to enable), counseling the benefits of moringa to the community (to predisposing), and advocating for local policy regulations to support moringa programs (to reinforce).

3.1 To predisposing: Socialization benefits of moringa leaves to improve the nutritional status of the community

Pencerah Nusantara, together with the Poto Tano Health Center, conducted a socialization about the benefits of Moringa leaves for nutritional fulfillment. Because there is no special fund to socialize this program, the delivery of information is done by inserting it into the nutrition class agenda and cadre mentoring activities.

3.2 Enabling factor: Training Making Moringa pudding to health cadres and advocating village funds

In addition to providing knowledge about the benefits of Moringa leaves, Pencerah Nusantara and Puskesmas Poto Tano also conduct training on making Moringa pudding and other simple preparations such as Moringa Moringa and Moringa Nuget as examples of PMT counseling. However, due to limited funds, the Moringa Program is running slowly. Only a few Posyandu can implement it.

3.3 Reinforcing factors: Regents of the Bupati to support the Kelor Program

In mid 2017, the moringa program was introduced to BAPPEDA. An explanation of the benefits of Moringa leaves which contain high nutrition is welcomed by them. In fact, BAPPEDA considers the moringa program to be one of the program solutions to overcome nutritional problems in West Sumbawa Regency. Finally BAPPEDA submitted this proposal to the Regent during the preparation of the Local Nutrition Action Plans (RAD-PG). The proposal was accepted and made Perbup No. 80 of 2017 concerning the Planting and Preserving Moringa (Gemari Kelor) Movement.

4. The impact of Pergub Gemari Moringa No. 80 of 2017 towards the development of the Moringa Program

Based on Table 3, regulation has the function to strengthen behavior change so as to produce a supportive environment. In this Moringa program, based on the impact caused, the regulation causes the Moringa program to develop rapidly. The Moringa program developed not only in the District of Poto Tano but also expanded into West Sumbawa Regency. The regulation also has an impact on the increasing number of cross-sectors involved (Table 7).

Some progress of the Moringa Program after the issu-
The West Sumbawa District Health Office invites Pencerah Nusantara and the Poto Tano Health Center to disseminate the benefits of Moringa leaves and training on making Moringa PMT Penyuluhan in all West Sumbawa District Health Centers. This activity was given a theme: “Weight gain through the use of Moringa-based community nutrition posts (Giat)”. The importance of community readiness program in Mor-

Pencerah Nusantara and the Poto Tano Health Center to disseminate the benefits of Moringa leaves and training on making Moringa PMT Penyuluhan in all West Sumbawa District Health Centers. This activity was given a theme: “Weight gain through the use of Moringa-based community nutrition posts (Giat)”.

The community readiness assessment as pre program, during and post program activity has helped the moringa program to be more specific and culturally relevant to the community. Community readiness model provided qualitative data of the using of moringa in the community of Poto Tano on daily basis. From the data given, most of the people are relevant to the moringa as it is very common in their land and already consumed the moringa. However, they still consider moringa having less nutrient compared with other vegetables. Knowing this gap, the approach of moringa program can be more specific. It is started by educating the cadres and mothers about moringa’s nutrient as they are the ones who culturally relevant with moringa. Mostly mothers in Poto Tano playing a role as a chef in their households and cadres are the ones who serve provision of supplementary feeding and complementary feeding at integrated health post (Posyandu). Knowing where to specifically start and which one the target were key inputs of the sustainability of moringa program.

It was showed that readiness of community was one of key factor that support the moringa program in West Sumbawa District. Based on Edwards et al. (14), once a community has achieved a stage of readiness where local efforts can be initiated, community teams can be trained in use of the community readiness model. These teams can then develop specific, culturally appropriate efforts that use local resources to guide the community to more advanced levels of readiness, eventually leading to long-term sustainability of local community efforts.

The readiness of the community and related sectors in implementing the moringa program have supported the process of the implementation well. Poto Tano Health Center was highly interested to collaborate and took a role as an implementor by taking moringa program as a part of the Public Health Center program. The local cadres and mothers at integrated health posts were easily engaged by Pencerah Nusantara and Poto Tano Health Center. The participation of these targeted groups in the activities of the program such as the socialization and workshop of creating moringa-based foods were high. The other important sectors like head of villages and sub-villages were also opened to be advocated.

Bottom-up advocacy and stakeholder collaboration to a regulation product.

Based on article by Linberg (15) The bottom-up generated data contributes to the further development of existing innovation theories by exposing a causal relation between context, organization and outcomes—implying that experiences of marginalization evoke entrepreneurial types of innovation systems rather that institutional, engendering a wider range of innovations.

The advocacy of moringa program was bottom-up advocacy. The program was initiated by Pencerah Nusantara in 2016. Pencerah Nusantara program is a program that strengthen primary health care by deploying young health professional to rural area in Indonesia. Pencerah Nusantara saw a potential of moringa in Poto Tano, the moringa trees are common throughout the land of West Sumbawa.

Pencerah Nusantara collaborated with Posyandu at integrated health post (Posyandu) to serve the moringa-based foods as provision of supplementary and complementary feeding. The advocacy of moringa program was accelerated to the heads of villages and sub-villages. The advocacy included journal presentation of moringa’s benefit in reducing malnutrition and best practices of moringa program at integrated health posts. In 2017, the implementation of moringa program was executed at all integrated health posts in Poto Tano.

In same year of 2017, the advocacy was lifted up to the planning and development agency (Bappeda) of...
West Sumbawa District. The planning and development agency is technical institutions for development, research and planning in the regional level. Pencerah Nusantara and Pototano Health Center delivered best practices and evidence based of moringa program in changing the habit of the cadres, mothers and villages who previously served preservative packaged food at integrated health posts in Pototano Health Center Area.

As a result of advocacy, the planning and development agency (Bappeda) of West Sumbawa District included moringa program to the planning of local food and nutrition action plan as stipulated in the district regulation No. 80/2017 about the preservation of Moringa.

The decreasing cases of underweight in children under five at Poto Tano Health Center

The Moringa program is a part of maternal health, nutrition and health promotion program that is carried out at Pototano Health Center. The program started by educating people, especially the cadres and mothers at health center about the nutrient of moringa as a local food ingredient that is accessible and plenty in their community. This part also encouraged the mothers to serve moringa-based foods to their family.

The step continued with cooking demo of creating moringa-based foods. The moringa was processed into various meals and snack such as meatball, nugget, pudding and ect. The workshop was lead by the nutritionist using the literature to make sure the outcome products fulfilled the criteria of high nutrition foods for children.

Moringa-based foods then served as a provision of supplementary and complementary feeding at integrated health posts (Posyandu). The movement keptadvancing, moringa based-foods served regularly as complementary feeding at integrated health posts (Posyandu) parallel with the practice of creating moringa-based foods in the households by the mothers.

A year after the moringa program launched there was a decreasing case of underweight in children under five at Pototano Health Center from 21.8% in 2017 to 2.8% in 2018.

The moringa program for combating malnutrition that run in senegal in 1997 by CWS (Church World Service), AGADA (Alternative Action for African Development) and local health posts also showed the successful treatment of malnourished children (2).

The Nutritional value of moringa compared with other food based on journal called Moringa oleifera: a natural gift-A review 2010 It is also mentioned that moringa is one of the richest plant sources of Vitamins A, B {1,2,3,6,7}, C, D, E and K. The vital minerals present in Moringa include Calcium, Copper, Iron, Potassium, Magnesium, Manganese and Zinc. It has potential benefit in malnutrition, general weakness, lactating mothers (2).

The impact of the regulation

Based on Devid Clarke (16) a range of decisions that were once taken by a health minister or a health ministry are now taken by regional and local government, autonomous public sector agencies, private firms, non-governmental organizations and individuals. As a result, regulation has grown in importance as a key lever for governments to affect the quantity, quality, safety and distribution of services in health systems.

The district regulation No. 80/2017 about the preservation of Moringa is a local government regulation that implemented in regional level. This regulation that produced by the head of district was easily follow up by the related sectors below: The local regulation is more relatable to the community now days as it is a reflection of their habit, strength, need and opportunities. The local regulation is easily follow up by the sectors below as the the hierarchy runs firmly because of the regional autonomy.

The policy regulates the preservation of Moringa through planting moringa around the house of the community and utilizing moringa as an ingredients of as provision of supplementary f and complementary feeding in all subdistricts of West Sumbawa District. The regulation impacted over 130,000 people of West Sumbawa. The regulation also motivated the planning and development agency (Bappeda) to conduct operational research of moringa processed industry in java.

The other sector that also impacted by the regulation is DHO (District of Health Office). In 2018, the institution encouraged all public health center to use moringa as an ingredients for provision of supplementary and complementary feeding at integrated health post. The villages as a grass-root institution allocated village fund for moringa program and by this the community run the moringa program independently.

Disclosure of state of COI
No conflicts of interest to be declared.

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