

## Impact Assessment Study Report

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### More Income Generated for Poor Families in Indonesia (MORINGA)

**Project and study funded by Australian Government  
Department of Foreign Affairs and Trade ANCP**

**Independent Evaluation completed by:**



Commissioned by World Vision Australia and Wahana Visi Indonesia

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# Executive summary

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## Introduction and context

Poverty is a chronic issue particularly in the rural areas of eastern Indonesia. Indonesia's statistic agency reported that in 2016, 10.9 percent of Indonesia's population (or more than 28 million people) were classified as poor, with 17.7 million residing in rural areas. These people are living on less than US\$1.00 per day (the national poverty line is IDR 354,386 or US\$27 per capita per month).

The contribution of the agriculture sector to the overall economy has been declining, but it is still a major employer. Therefore, promoting growth in the agriculture sector is one of the key pathways for poverty alleviation, as most of the rural poor depend on the agriculture sector as their main source of livelihood.

On that account, the main challenge is how to increase the competitiveness of the agriculture sector in targeted areas. A range of improvement strategies are needed to accelerate the economic growth in this sector, particularly in regions outside Java. These include increasing levels of private sector investments to enhance the productivity and value of underdeveloped value chains.

## World Vision's response

The project's goal of increasing poor farmers' income has a direct contribution to poverty alleviation, a central development issue in Indonesia, and is consistent with the national government policy.

The project will develop an enabling business environment that supports both male and female farmers from production to the marketing of moringa, maize and pili nuts, as well as other potential agricultural commodities. The project is located in three Indonesian provinces, namely, Central Sulawesi, East Nusa Tenggara and North Moluccas, with interventions currently operational in at least two districts from each province.

<b>Duration:</b>	1 July 2017-30 June 2022
<b>Budget:</b>	US\$2,800,760
<b>People supported by the project (N):</b>	Develop a network of partners in the districts, provinces and at the national level to increase the income of 4,000 families by 2022.

The MORINGA project applies to World Vision's Inclusive Market Systems Development (iMSD) approach, a hybrid push/pull programming approach to market development that is based on both 'making markets work for the poor' (M4P) and traditional value chain development programming. At its core, this approach focuses on facilitating changes within market systems, in partnership with private actors, to make markets work more inclusively for poor farmers. The target is to increase the income of 4,000 farming families by 2022.

## The impact assessment study

The purpose of this impact assessment is to assess the project's progress towards achieving the project targets. This evaluation employs mixed methods by combining quantitative and qualitative approaches, which are:

1. **Quantitative: Household surveys.** For the quantitative aspect, household surveys were carried out by using stratified random sampling with a 90% confidence level and a 10% margin of error.

- **Maize:** Stratified random sampling for the maize impact assessment was started by randomly selecting intermediary service providers<sup>1</sup> (ISPs) who reported selling hybrid seeds which were introduced by the project. A total of 10 ISPs were selected with the probability proportional to size (PPS) sampling approach using the amount of sales as a referencing parameter out of 43 known ISPs, with these ISPs representing around 66.96% of the total amount of increased sales recorded. With a 90% confidence level and a 10% margin of error, the sample size was decided at 82 respondents for beneficiaries who use the hybrid seed without generally accepted practices (GAP) which already include 20% excess sampling for the cleaning dropout process. The other three groups: farmers adopting seed with GAP, farmers adopting GAP only and a control group also using the same sample size, increased the total sample size taken to 328.
- **Pili nuts:** A total of 64 farmers were interviewed for the sample, oversampled by 30% from the minimum obtained, with a 90% confidence interval and a 10% margin of error. The samples were distributed evenly throughout the areas where the sampled ISPs are located. Sampling at farmer level was carried out using simple random sampling from the pre-populated list. A before and after comparison was utilised in the impact assessment for the intervention impact as this methodology was considered straightforward without too much interference from external factors and potentially affected all the farmers in the area.
- **Moringa seeds:** A total of 65 farmers were interviewed for the sample, oversampled by 30% from the minimum obtained, with a 90% confidence interval and a 10% margin of error. As with the pili nuts, a before and after comparison was utilised in the impact assessment as the intervention design is similar.

2. **Qualitative: Most Significant Change (MSC).** The MSC approach with in-depth interviews was specifically chosen for the qualitative method. The following parameters have been agreed by World Vision as themes of significant change, all of which fit with this project:

- **Business sustainability** of relevant entrepreneurs (off-taker, input providers, ISP and/or farmers) to capture transformation in the business practice.
- **Gender:** the effect of business improvement to the livelihoods of female and male farmers, concerning their role as farmers and decision-making processes.
- **Child wellbeing:** this parameter captures the story of how income has positively or negatively affected child wellbeing in agri-communities.

## Key findings

This study was conducted in October 2019, therefore the cut-off date for data was August 2019.

1. **Maize.** The maize intervention business model has led to the introduction and improvement of access to seed and GAP for maize farmers in Central Sulawesi. The business model employs a mainstay supply chain approach that involves distributors and/or retailers (both existing and new) as ISPs. The highlights of the maize intervention are as follows:

- Number of adopter farm households (farmers that use quality hybrid seed and practice GAP): 639
- The most effective GAP in increasing farmer productivity: Apply second fertilisation
- Number of farm households who experienced increased income because of the maize intervention: 273 HH (43%)
- Farmer's opinion with regard to maize cultivation:
  - Very Profitable: 38%
  - Profitable: 50%
  - Slightly Profitable: 13%
  - Not Profitable: 0%
- Maize productivity increase: 2,118 kg/ha

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<sup>1</sup> Intermediary Service Providers are small businesses and retailers who take part in the networks of value chain development.

- Average increase in income per households: A\$706 OR 490 USD
  - Percentage of farmers with disabilities: 11%
  - Maize farming is male-dominated agriculture, both in the farming role and decision-making process, as indicated by Level of Effort – female/male: 17%/83%; and Level of Control – female/male: 12%/88%
  - Number of male/female children: 137/125. The impact assessment suggested that all three requirements of CWB have been met in the targeted area: in terms of proportion of household with adequate food frequency for children (88%), proportion of parent or caregivers who are able to pay for their children’s health cost without external assistance (87%), proportion parent or caregivers who are able to pay for their children’s basic education cost without external assistance (97%).
2. **Pili nuts.** Access to market was the main innovation felt by pili nut farmers in East Nusa Tenggara. By introducing more buyers to the market, it is expected that farmers could increase their sales and therefore improve their income. The highlights of the pili nut intervention are as follows:
- Number of adopter farm households (farmers that sell the pili nuts to project’s partners): 120
  - The most effective GAP in increasing farmer productivity: Drying shelled pili nuts (93 HH applied) and breaking hard shells (116 HH applied)
  - Number of farm households who experienced increased income because of the pili nuts intervention: 94 HH (79%)
  - Farmer’s opinion with regard to pili nut cultivation:
    - Very Profitable: 44%
    - Profitable: 38%
    - Slightly Profitable: 16%
    - Not Profitable: 2%
  - Pili nut productivity increase: 19 kg/farmer
  - Average increase in income per household: A\$103 OR 71 USD OR 71 USD
  - Percentage of farmers with disabilities: 12%
  - Pili nuts farming is female-dominated agriculture, both in the farming role and decision-making process, as indicated by Level of Effort – female/male: 67%/33%; and Level of Control – female/male: 62%/38%
  - Number of male/female children: 88/121. The impact assessment suggested that all three requirements of CWB have been met in the targeted area: in terms of proportion of household with adequate food frequency for children (76%), proportion of parent or caregivers who are able to pay for their children’s health cost without external assistance (89%), proportion parent or caregivers who are able to pay for their children’s basic education cost without external assistance (93%).
  - Overlap with moringa seeds intervention: 4% from user and beneficiary
3. **Moringa seeds.** The innovation for moringa is considered straightforward and simple (located only on the islands of Timor and Alor – 228 users). The innovation involves the introduction of business opportunities to cultivate moringa seeds, introducing techniques to carry out the cultivation and developing market access to gain additional income. The highlights of the moringa seeds intervention are as follows:
- Number of adopter farm households (farmers that sell moringa seeds): 228
  - The most effective GAP in increasing farmer productivity: Planting stem cuttings (*menanam stek batang*)
  - Number of farm households who experienced increased income because of the moringa intervention: 205 HH (43%)
  - Farmer’s opinion with regard to moringa cultivation:
    - Very Profitable: 50%
    - Profitable: 37%
    - Slightly Profitable: 13%

Not Profitable: 0%

- Average additional/new moringa trees developed: 22.5 trees/16.27 kgs per household
- Average increase in income per household: A\$59 OR 41 USD
- Percentage of farmers with disabilities: 11%
- Moringa seed farming is gender-balanced agriculture, both in the farming role and decision-making process. Male and female are equally balanced as indicated by Level of Effort – female/male: 55%/45%; and Level of Control – female/male: 52%/48%
- Number of male/female children: 205/160. The impact assessment suggested that all three requirements of CWB have been met in the targeted area: in terms of proportion of household with adequate food frequency for children (85%), proportion of parent or caregivers who are able to pay for their children's health cost without external assistance (96%), proportion parent or caregivers who are able to pay for their children's basic education cost without external assistance (90%).

#### 4. Program level

The program is on track with the actual number of beneficiaries being slightly higher than the target (527 HH compared to target of 400 HH). Based on the program design document, MORINGA is expected to achieve more than 500 users by the end of 2019. According to data from the impact assessment, the total number of users is 987 HH. The figures consist of maize (639), moringa (228), and pili nut (120). The achievement significantly exceeds program targets which is a good indicator that the program is on track to meet the expected goals. This figure has shown that MORINGA interventions could work as a development catalyst for respective commodities. Maize and moringa contributed most of the achievement with 273 and 205 HH respectively, whereas pili nut added another 94 HH. However, there is an overlap between pili nut and moringa farmers (4%), meaning that after adjustment for this overlap, the total number of users for all three interventions is 982 HH, whereas the total number of beneficiaries is 568 HH.

## Conclusion

**The project has successfully increased household income for farming families using the iMSD approach.** Most farmers have increased their income, with the highest percentage (of total adopters) delivered by moringa seeds (90%), but in terms of value, the maize intervention has brought the largest increase in income per family (A\$706 OR 490 USD per HH). The maize intervention has also contributed the largest number of users (639 HH – 65%) and beneficiaries (273 HH – 48%) to the program.

**The effectiveness of project partners' introduction and investment in the new business models is proven.** Overall, most project partners have facilitated agricultural information to the farmers and provided a supporting function on the ground that has been identified in each project. Key project private sector partners (PSPs) are Syngenta (for maize), MOI and recently PT Morifa (for moringa seeds) and PT Timurasa and CV Pondok Daya (for pili nuts).

**Project success in facilitating market linkages with PSPs resulted in the adoption of business models and improved agricultural practices by at least 987 farmers.** However, the adoption of GAP and/or good post-handling practices are still lacking in certain cases:

- Maize: At least 639 farming households are estimated to have adopted the utilisation of hybrid seeds, but only 4% have adopted the improved GAP application (beyond seeds).
- Moringa seeds: 228 farmers were known to adopt the introduced innovation which focuses on market access to harvest and sell moringa-related products such as its leaves and seeds. However, the adoption of GAP is very limited in line with the limited focus of its dissemination.
- Pili nuts: At least 120 farmers have adopted the practice of harvesting and selling pili nuts in targeted areas, either with better prices from existing buyers and/or through new buyers. This is in line with the strategy of the intervention.

**The project is successfully working with the private sector in delivering change, with each intervention demonstrating success in different degrees and aspects.**

Moringa seeds and pili nuts are not a common commodity in Indonesia and therefore expansion may be limited by the size of the market. However, the strong features of both interventions are (1) simplicity of business model, which brings (2) a simple monitoring/documentation system for the program and (3) simple pathways for adopters to increase their income.

The maize intervention business model is more complex than the moringa and pili nut interventions and therefore requires more investment in documentation and monitoring systems. However, one of the strongest features of this intervention is its scalability – it delivers (1) the biggest increase in income and (2) the most farmers who have adopted it (double that of pili nuts and moringa).

This first impact assessment of MORINGA suggests that the project has succeeded in delivering a positive impact towards the targeted communities, with plenty of room for improvement, especially in terms of scaling up and properly monitoring the intervention.

## **Lessons and recommendations for refining the project design**

1. The MORINGA project has been successful in delivering strong outreach and income results. However, to ensure future strategic improvements the team should consider the following:

- a) Maize: the intervention is currently located in some conflict-prone areas. This is limiting private sector appetite to expand or invest more in these areas. If the team are to continue to operate in these regions, some additional planning into mitigation strategies is advised.
- b) Moringa seeds and pili nuts both work in niche markets which means that expansion tends to be limited. A better understanding of the global/regional market for moringa and pili nuts will help guide investment in further expansion opportunities for these products.

Considering this, new commodities or operational areas may be required. Given that the expansion of moringa and pili nut farming is limited by geographic factors (both are perennial plants) and market limitations, as well as the risk of local conflict in Sulawesi, management needs to think more about the TAM (Total Addressable Market), SAM (Serviceable Addressable Market) and SOM (Serviceable Obtainable Market) of each commodity in the local market. Their decision on future investments, as well as decisions around adding new commodities and geographic regions, should be informed by this analysis.

2. Gender may be a key strategy when considering the expansion of the moringa seeds and pili nuts interventions. The quantitative survey indicates the significant contribution made by women towards the farming (level of effort) and decision-making processes (level of control) when it comes to the moringa and pili nuts farming business. The stories collected from both interventions also support the narrative that the intervention has strengthened the social role of women in the community and opened up more jobs/income streams for women.

3. People with disabilities also make up a significant percentage of those involved with the existing interventions (11% in maize and moringa, 12% in pili nuts). The project may wish to further develop its program-level strategy to help their team tap into this subgroup.

4. Monitoring and documentation in maize intervention needs to be strengthened to support the case for attribution. The maize intervention works on a business model that is more complex than the moringa and pili nut models. For this reason, the project team needs to invest more in the monitoring and documentation systems in order to capture the numbers with a higher degree of accuracy.

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Nevertheless, we express our gratitude toward every stakeholder for their kind co-operation and encouragement which helps us in the completion of this assignment.

Last but not least, we hope this report would support World Vision Australia and Wahana Visi Indonesia to improve the economy of smallholder farmers in Eastern Indonesia.  
Soli Deo Gloria!

Kupang, March 2020

QED-Research Consulting



## Affirmation

Assessment study described herein consists of original work, undertaken as a collaboration between Wahana Visi Indonesia (Partner of World Vision International) and QED. It is undertaken to guide future activities, describe and advance learning, and generate evidence of World Vision's development effectiveness as part of the requirements of World Vision's Learning, Evaluation, Accountability and Planning System.

May 2020

Mitra Tobing  
Ministry Quality and Impact Director, Wahana Visi Indonesia

## Glossary of acronyms

The following acronyms are used in this report:

ANCP	Australian NGO Cooperation Program
AP	Area Program
CBO	Community Based Organisation
CED	Community Economic Development
CWB	Child Wellbeing (includes food, health, education)
DFAT	Australian Government Department of Foreign Affairs and Trade
DME	Design Monitoring and Evaluation
FGD	Focus Group Discussions
FAO	Food and Agriculture Organization (United Nations)
FAW	Fall Armyworm
GAP	Generally Accepted Practices
HH	Household
iMSD	Inclusive Market Systems Development
ISP	Intermediary Service Provider
KII	Key Informant Interview
LoC	Level of Control
LoE	Level of Effort
MSC	Most Significant Change
NTT	Nusa Tenggara Timur
PLA	Participatory Learning and Action
PSP	Private Sector Partner
ToR	Terms of Reference
WEE	Women Economic Empowerment
WVA	World Vision Australia

## About this report

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## I. Project background and context

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**Poverty is a chronic issue particularly in the rural areas of eastern Indonesia**<sup>2</sup> where most of the population depend on agriculture as their main source of livelihood. Statistics Indonesia noted that 49.41 percent of poor households in Indonesia depend on the agricultural sector as their main source of income.<sup>3</sup> Project MORINGA is designed to develop a network of agribusiness partners in the districts and provinces (and at national level) in Indonesia to increase the income of 4,000 families by 2022. The project will develop an enabling business environment that supports both male and female farmers from production to the marketing of moringa, pili nuts, maize and other potential agricultural commodities. The project is located in three provinces which are Central Sulawesi Province, NTT Province and North Moluccas Province. The project was implemented in at least two districts in each province.

**The project applies World Vision's Inclusive Market Systems Development (iMSD) approach**, a hybrid push/pull programming approach to market development that is based on both making markets work for the poor (M4P) and traditional value chain development programming. The uniqueness of iMSD is its intentional push/pull programming for inclusion. The 'pull' side focuses on the market system, by improving commercial functionality of the market to operate more sustainably and beneficially for people living with poverty. It works with the private sector to change behaviours and 'pull' poor people into markets as producers, employees and consumers. The 'push' side focuses on households and individuals, developing strategies to help people living with poverty to equitably participate and benefit from market systems. On the 'push' side, the program works on training in nutrition, improving practices related to farming as a business and financial literacy, and encouraging coaching, information and knowledge sharing, collective bargaining and social protection, all to assist with better engagement in the market system.

In line with World Vision's iMSD approach, the expected outcomes of this project are:

- Outcome 1 – Established network of partners to develop moringa and other commodity value chains
- Outcome 2 – Partners introduce and invest in improved inclusive business models
- Outcome 3 – Male and female farmers adopt improved agricultural practices and participate in new value chains
- Outcome 4 – Ensure project quality in compliance with design, monitoring and evaluation systems.

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<sup>2</sup><https://finance.detik.com/berita-ekonomi-bisnis/d-3795632/bps-kemiskinan-masih-terpusat-di-indonesia-timur>

<sup>3</sup> BPS, Penghitungan dan Analisis Kemiskinan Makro Indonesia, 2019.

## 2. Project location and estimated beneficiaries

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When this study was conducted, the MORINGA Project was implemented in two provinces:

- **East Nusa Tenggara (NTT) Province:** Focus on moringa (seed, excluding leaf). The intervention has been implemented in the Alor and Kupang districts, while the pili nut intervention is active in Alor District.
- **Central Sulawesi Province:** Focus on maize. The intervention has been implemented in Sigi, Dongga, Touna, Parigi, Poso, Tolitoli and Buol districts.

The project's participants and beneficiaries' target is as follows:

- **Participants: 10,000 households.** The participants are the number of people who participate in project activities including socialisation, demonstration plots, training, etc. Not all the participants experience an increase in their income. This explains why the number of participants is bigger than beneficiaries.
- **Direct beneficiaries are 4,000 families.** Beneficiaries are defined as the number of households who experience an increase in income due to the project intervention.

## 3. Purpose and scope of the impact assessment

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**The purpose of this impact assessment is to assess the project's progress towards achieving the project targets.**

The impact assessment process covers collection and analysis of both quantitative and qualitative data for measuring the impact of goal and outcome indicators in the logical framework of the project. Data was collected to provide the project with a grounded view of how the intervention has widely affected the targeted population, and to verify and complement the project's regular monitoring activities.

**The evaluation survey was carried out on project beneficiaries who were known to have finished at least one business cycle under the intervention treatment.**

As a result, the scope of the assessment is limited to the three most developed commodities – maize in Central Sulawesi and pili nuts and moringa seeds in East Nusa Tenggara. The focus of the survey is on how the intervention has benefited the agribusiness performance of farmers, including the performance and sustainability of the project's overall business model, and how improved income is having an impact on the livelihoods of families and child wellbeing.

## 4. Impact assessment objectives and questions

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**The main objective of this impact assessment is to obtain data for measuring the impact of goal and outcome indicators in the logical framework of the project.** Both quantitative and qualitative methods were used to measure the program's efficacy.

The qualitative method uses a realist approach which specifically looks at the 'contexts' and 'mechanisms' that result in an outcome. The result of the impact assessment will not be compared to the baseline data but rather compare outcomes between 'user' and 'non-user' farmers (treatment and control for a quasi-experimental design). The data collected via the qualitative study is then combined with the quantitative survey and fed into a synthesis process to provide a high-level analysis of these cross-cutting issues.

With regard to the project implementation strategy, specifically on the elements of inclusion, 'do no harm', environmental sensitivity and child wellbeing, through this impact assessment, the project will

obtain and analyse data in regard to cross cutting issues related to gender inclusion, disability inclusion, child well-being and environment.

**The key evaluation questions for the impact assessment (outcome monitoring) data collection are:**

Key Question	Guiding Sub-questions
1. To what extent did the project increase household income for farming families using the M4P approach? (Goal)	<ul style="list-style-type: none"> <li>• What is the status (value) of household income of those adopting improved agricultural practices in that period of time?</li> <li>• How much has the income increased?</li> </ul>
2. How effective has the partners' introduction and investment in the new business models been? (Outcome 2)	<ul style="list-style-type: none"> <li>• To what extent do partners facilitate agriculture information to farmers?</li> <li>• To what extent do farmers feel the agricultural information delivered by partners is beneficial?</li> </ul>
3. To what extent did farmers adopt improved agricultural practices? (Outcome 3)	<ul style="list-style-type: none"> <li>• What factors influence farmers' decision making to adopt improved agricultural practices? Who makes the decision?</li> <li>• What resources need to be in place for farmers to put the decision in adopting improved agricultural practices into action?</li> </ul>
4. Is the project on track to deliver evidence of impact? (Outcome 4)	<ul style="list-style-type: none"> <li>• How effective is World Vision partnering with the private sector in delivering change?</li> <li>• Are the M&amp;E processes in place adequate to support a M4P design?</li> </ul>

## 5. Methodology

This evaluation study employed mixed methods, by combining quantitative and qualitative approaches as follows:

1. **Quantitative: Household Survey.** The Household Survey was carried out by utilising **stratified random sampling with a 90% confidence level and a 10% margin of error.** The measurement was chosen to provide a reasonable rigidity while maintaining the data collection's operational feasibility, with various sources utilised as the sampling starting point.
2. **Qualitative: Most Significant Change (MSC).** The MSC approach with in-depth interviews was specifically chosen for the qualitative method in order to provide more detailed insights into how the intervention can best benefit targeted beneficiaries and their families. The following parameters were agreed by World Vision as themes of significant change that fit with this project:
  - Business sustainability of relevant entrepreneurs (off-taker, input providers, ISP and/or farmers): this parameter aims to capture significant change in the agribusiness activities.
  - Gender: the effect of business improvement to the livelihood of female and male farmers is important for World Vision.
  - Child wellbeing: this parameter captures the story of how income has positively or negatively affected child wellbeing in agri-communities.

Representative stories from the MSC process have been included in the body of this report.
3. **Difference in differences method** was employed in this impact assessment as a precaution on the presence of various external factors considering the wide area and diverse population to be covered. This is expected to provide a clearer impact figure attributable to the project's activity.

Specific survey methodology was tailored to address the diverse contexts and conditions in each of the impacted commodity interventions, briefly elaborated as follows:

## I. Maize - Central Sulawesi

**Innovations brought through this intervention are the introduction of hybrid seed and GAP for maize.** A hybrid seed producer (Syngenta) was selected as project partner, which aims to scale up and boost the adoption of hybrid maize variety. This partnership is expected to improve maize farmers' yields and income. Therefore, the business model is developed based on the maize supply chain system where the seeds are distributed through a network of distributors and retailers at rural level – which are dubbed ISPs (intermediary service providers).

### Quantitative

- **Stratified random sampling for the maize impact assessment was started by randomly selecting ISPs who recorded selling hybrid seeds introduced by the project.** A total of 10 ISPs were randomly chosen with a probability proportional to size (PPS) sampling approach using the amount of sales as a referencing parameter out of 43 known ISPs, with these ISPs representing around 66.96% of the total amount of increased sales recorded.
- **Samples for the maize impact assessment were taken from farmers who accessed information and availability of seeds from these ISPs,** looking across two outcomes: ratio of adoption of practices and ratio of increased income.
- **Total sample size for maize is 328 farmers.** With a 90% confidence level and a 10% margin of error, the sample size was decided at 82 respondents for beneficiaries who use the hybrid seed without GAP. The number is considered sufficient to represent the seed user without the GAP category which already includes 20% excess sampling for the cleaning dropout process. The other three groups: farmers adopting seed with GAP, farmers adopting GAP only and control groups are also included in the same sample, making the total sample size 328. While the sampling is developed with required samples per category, the actual data collection is done randomly and not intended to be a quota-based approach.
- **The main goal is to enable an analysis of conversion ratio from farmers with access into one of the possible groups:** (1) farmers utilising hybrid seed only, (2) farmers utilising hybrid seed along with GAP, (3) farmers adopting GAP only, as well as (4) a control group. With the project aimed at converting farmers with access into users who used both hybrid seed and GAP, this, alongside various other inquiries made in the study, would provide hints as to what worked at the field level, what kind of challenges were present and how to improve the implementation to make it as good as it can be.
- **All the samples were distributed proportionally according to the potential calculated number of farmers utilising the seeds.** This was decided to ensure that the study would at least get a result from the seed user category, since the rest were low in number. When some categories were found to have an insufficient number of samples, these were classified as case-by-case findings, and the overall impact was established from categories with a significant presence.

### Qualitative

- **In total, project staff documented four maize significant change (SC) stories,** of which some focused on ISPs and others on farmers. SC stories are collected from those most directly involved, such as participants and field staff. It is initially up to respondents to allocate a domain category to their stories. In addition to this, respondents are encouraged to report why they consider a change to be the most significant.
- **The SC stories are then analysed to capture elements of significant change relevant for World Vision.** As discussed above, the three parameters that have been set as significant change elements are business sustainability, livelihoods of female and male farmers, and child wellbeing in farming communities.
- **Based on the analysis of the three agreed parameters, three stories were selected for follow up.** Interviews were conducted on the ground by the writers of the stories to gain more in-depth understanding. An additional story was prepared to fill the gap on the absence of SC stories related to private sector partners.

## 2. Pili nuts - East Nusa Tenggara

**Access to market is the main innovation introduced to pili nut farmers in East Nusa Tenggara.** With more buyers introduced into the market, it is expected that farmers could sell more and thus improve their income.

- **The impact assessment for this business model was started via stratified random sampling from the buyers down to farmer level.** Different from the maize impact assessment, the pili nut study was carried out directly at adopter level. Since the scale of the intervention was small enough and the monitoring results considered satisfactory enough, no new findings were expected. A list of farmers who sell was pre-populated from the buyers (ISPs in this intervention) and then sampled to become respondents.

### Quantitative

- **A total of 64 farmers were interviewed for this sample, oversampled by 30% from minimum obtained, with a 90% confidence interval and a 10% margin of error.** The samples were then evenly distributed to the areas where sampled ISPs are located. Sampling at farmer level was carried out using simple random sampling from the pre-populated list. A before and after comparison was utilised in the impact assessment as the intervention impact is considered straightforward without too much interference from external factors or anything else that may affect farmers in the area.

### Qualitative

- **There was only one pili nut SC story developed by the project.** The story is about Veronika Bele Asafaof, a woman farmer in Alor. As this is the only story on pili nut farming, the story was improved by consultants to highlight significant change elements on business sustainability, the livelihoods of female and male farmers, and child wellbeing in the farming community.

## 3. Moringa seeds - East Nusa Tenggara

The moringa intervention is also considered quite straightforward and free from external influences, despite not being as simple as the pili nut intervention. These innovations involved the introduction of business opportunities to cultivate moringa seeds and techniques to carry out the cultivation. The impact assessment for this business model was started via stratified random sampling from the buyers down to farmer level. A list of farmers who sell was pre-populated from the buyers (ISPs in this intervention) and then sampled to become respondents.

### Quantitative

- **A total of 65 farmers were interviewed in this sample, oversampled by 30% from minimum obtained, with a 90% confidence interval and a 10% margin of error.** The samples were then evenly distributed to the areas where sampled ISPs are located. Sampling at farmer level was carried out using simple random sampling from the pre-populated list. A before and after comparison was utilised in the impact assessment as the intervention impact is considered straightforward without too much interference from external factors or anything else that may affect farmers in the area.

### Qualitative

- **The project developed seven moringa SC stories,** of which six stories focus on farmers' experiences and one on PT MOI, a moringa off-taker with a base operation in Kupang, NTT. These stories were assessed to identify significant change elements on business sustainability, the livelihoods of female and male farmers, and child wellbeing in the farm community.

Detailed information regarding the methodology for each household survey is available in **Annex 2**.

## 6. Extent of independence of the evaluation team and declaration of conflicts of interest

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QED-Research Consulting is a research consulting firm that is based in Surabaya and Denpasar. Our research consulting aims to provide a one-stop service related to research, data, and monitoring-evaluation. The services we provide include market research, business intelligence, data science, consultation, training/capacity building, and evaluation assessment. Our research consulting firm is founded by Dr Daniel Kurniawan, ST, MA, MM, Rendy Soewitoardjo, SE, MBA, and several partners. QED-Research Consulting is also part of RSO Group, a business consulting group which is based in Surabaya. RSO Group is founded by Rendy Soewitoardjo, a business graduate from James Cook University, Singapore. He had been working for several Singapore companies before returning to Indonesia. He and several partners established QED-Research Consulting in 2013 in order to bring a world class research consulting service to the business, NGO, and academic sectors. RSO Group is not affiliated with World Vision International, World Vision Australia, Wahana Visi Indonesia, or DFAT Australia.

## 7. Ethical considerations of the study

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This study applies Australasian Evaluation Society (AES) evaluation ethics and principles, and uses their *Code of Ethics* and *Guidelines on Ethical Conduct of Evaluation* (revised July 2013)<sup>4</sup> as a guiding document to steer the process at all stages of the evaluation and as an integral element of best practice in evaluation implementation. These include:

- **Preparing for an evaluation.**
  1. All parties involved in commissioning and conducting an evaluation should be fully informed about what is expected to be delivered and what can be reasonably delivered so that they can weigh up the ethical risks before entering an agreement.
  2. All persons (including participants) who might be affected by whether or how an evaluation proceeds should have an opportunity to identify ways in which any risks might be reduced.
- **Conducting an evaluation**
  3. An evaluation should be designed, conducted and reported in a manner that respects the rights, privacy, dignity and entitlements of those affected by and contributing to the evaluation.
  4. Reciprocity. Participants giving their information to researchers should reap some benefit.
  5. An evaluation should be conducted in ways that ensure that the judgements that are made as a result of the evaluation and any related actions are based on sound and complete information.
- **Reporting the results of an evaluation**
  6. The evaluation should be reported in such a way that audiences are provided with a fair and balanced response to the terms of reference for the evaluation. Many, if not most, evaluations will have multiple audiences and the needs of each should be considered.

The AES evaluation ethics guideline provides outline procedures and lighthouse guidelines on all ethical principles observed at each of the above stages with the aim to treat all stakeholders equally and fairly in the evaluation process, reporting and use.

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<sup>4</sup> *Guidelines on Ethical Conduct of Evaluation* and *Code of Ethics* (Revised July 2013) is available at <https://www.aes.asn.au/join-the-aes/membership-ethical-guidelines.html>



## 8. Limitations of the study

The following are some of the factors that may have a limiting effect on the analysis and results of this impact assessment:

Component	Problem	Notes and implications
Implementation	High community mobility	The iMSD program is a dynamic process requiring the inclusion of new market information in the equation. Detailed discussions with the project team were conducted during the enumerator selection process which happened only 1-2 days prior to the project survey and has an implication for limiting flexibility when arranging the logistics on the ground. To make an announcement to the community one week before implementation is simply not a feasible option in some cases. Whilst the detailed discussion processes increased the accuracy of the methods applied by quantitative research, sometimes this is not enough to make necessary adjustments on the ground to respond. This is a trade-off that limits our process outputs.
	Dispersed geographic distributions	Project beneficiaries are situated in communities that are dispersed and fragmented over large areas. Good and significant progress sometimes happens in remote areas that require the evaluation team to travel more than 19 hours to reach them. Despite QED deploying an additional person (without any additional cost) to enable a maize survey in Sulawesi conducted by two teams in tandem (as opposed to the original single team), the time spent on travel to site locations was extensive for the maize intervention.
Method	Qualitative	There are only 13 stories submitted by the project team of which only one story relates to the pili nut intervention, and with moringa seeds there is a story of an off-taker. There was also a limited number of individuals involved in the story generation process, raising the possibility that some stories were inevitably overlooked. Sometimes this will result in underrepresentation of SC from remote areas or marginalised groups of the population, as their significant story may differ from those less marginalised people.
	Quantitative	The wide and diverse area to be covered in the study provides another challenge at hand, in terms of the high heterogeneity of the population surveyed. As a result, various external factors are expected to affect the study and this is especially true for the maize intervention. A comparison group approach with difference in differences analysis is utilised to circumnavigate this issue, along with several other normalisation approaches. However, there is always a chance that the data obtained may be skewed due to the fact that the number of samples taken is limited by the allowed budget and study feasibility. For pili nut and moringa, where the innovations are more straightforward, smaller in scale and generally affect all populations, the before and after comparison is considered sufficient and was utilised.

## 9. Discussion and findings

Both the quantitative and qualitative impact assessment studies were successfully carried out in December 2019 for three commodities in two provinces: maize in Central Sulawesi, moringa and pili nut in East Nusa Tenggara. The impact assessments lasted for around two weeks, implemented jointly by QED-Research Consulting and Wahana Visi Indonesia under direction from QED-Research Consulting. The summary of the main findings for the three commodities is as follows:

**Assumptions and data (including PPI, disability data, business calculation, etc.) used in planning intervention and the assumption of change are appropriate.** Based on the impact assessment proceedings and results, data was adequately available in the project and the project staff collected sufficient information to enable the project team to prepare business cases, identify opportunities, and work with private sector partners. In the case of moringa seeds and pili nuts these include off-takers and kiosks, and in the case of maize, these are maize seed producers and their distributors. The following table reflects the data adequacy for each commodity:

	Moringa seeds	Pili nuts	Maize	Total (program level)
<b>Quantitative</b>				
Final Sample Size <sup>5</sup> (# respondents)	65	64	324	453
Actual Sample (#respondents)	67	67	189	323
<b>Qualitative</b>				
# stories	7	1	5	13
Stories about:				
- Off-takers	1	0	0	1
- ISPs	0	0	4	4
- Farmers	6	1	1	8
Stories focus on: <sup>6</sup>				
- WEE	2	1	0	3
- CWB	2	0	0	2
- Business sustainability	3	0	5	8
Story analysed and improved by consultant	3	1	3	7
New story developed by consultant	1 (about off-taker)		1 (about off-taker)	2

### Maize - Central Sulawesi

The maize intervention business model involved the introduction and improved access to hybrid seed and GAP for maize. The business model employs a mainstay supply chain approach, that involves distributors and/or retailers (both existing and new) as ISPs.

#### Efforts required to maintain accuracy and update data and assumptions

The maize intervention involves work on a larger scale (including a larger area, larger beneficiaries, larger market players) and more complex markets (connected to various agricultural inputs, suppliers, off-takers, government policies, etc.). For this reason, it requires more investment in building

<sup>5</sup> Sample planned based on initial data provided by project team prior to fieldwork - which includes non-response error anticipation of 20-30%.

<sup>6</sup> These dimensions were agreed based on discussion between project team and impact assessment team prior to fieldwork. WEE: Women economic empowerment, CWB: Child Wellbeing.

assumptions and keeping updated as the market develops to maintain accuracy/appropriateness. Good examples of this are areas such as Buol and Touna where sales were high, despite the relatively short product introduction period. The number of study samples was well below what was planned, with only around 189 respondents compared to the initially planned 324. The reason, contrary to the project's initial assumption, was because in some areas of Central Sulawesi the farmers were already accustomed to hybrid seeds or heavily engaged in contract farming where the buyer determines the type of seeds utilised. Many respondents were excluded from data collection as they did not qualify for any of the targeted groups (no attributable changes, yet not qualified as a control group). In addition, some seed buyers were contract farming organisers and/or large-scale farmers, which has implications for farmer number accuracy, as it assumes that all additional sales come from smallholder farmers.

**A significant increase in Syngenta sales from 2 tonnes in 2018 to 9 tonnes in October 2019<sup>7</sup> indicates modalities of systemic change at PSP level.** This was achieved via both old and new supply chain paths, formed by a network of ISPs (existing and/or new distributors, retail shops, lead farmers, etc.) The intervention has successfully helped service providers and private sector partners, such as Syngenta, to identify and meet the market demand. The improvement in their business performance is real and acknowledged by the private sector partners, however, better documentation on pro-poor farmers in some areas will increase attribution linkage to projects. As mentioned previously, improvements in data documentation and updates will also support this.

**Changes in the market system were also observed at farm level.** On the ground, the availability of partners' hybrid maize seed was reported to have improved significantly, and some farmers switched to partners' products. Those farmers either switched from other hybrid seed brands/types or from a local maize variety that is usually obtained through a retaining method. In terms of input/market access approaches, partners have implemented more activities at a rural level, as well as ensuring product availability (by demo plots and other means of communication).

**In terms of inclusiveness and gender, the study found relatively high female involvement in access activities.** Around 56% stated that at least one adult female was present during the access activity. This high number reflects the project's efforts to promote a higher level of women's economic empowerment in a place where contribution (levels of effort) is 17% for females and 83% for males, and decision making (levels of control) is reported as 12% for females and 88% for males. While the sector is mainly male dominated, a relatively significant proportion (ranging from 30-70% depending on the topic in question) demonstrated a model where both males and females are involved in activities and decision making. The degree of involvement varies greatly. More equal involvement usually happens on a strategic level, such as selling assets (eg, large livestock) or deciding on new business activities.

**In terms of key areas of change in access, the adoption of hybrid seeds becomes the pivotal point that drives changes for the beneficiaries,** made possible by partners' efforts in ensuring the product's availability, as well as conducting promotions in the targeted areas. However, farmers adopting hybrid seeds does not directly translate into changes in agricultural practices. The amount of farmers who actually improved GAP application is small (less than 4%). Based on the regression analysis, the most effective GAP in increasing farmer productivity was second fertilisation.

**'Workshops/training' and 'field schools' are two of the most preferred approaches desired by the farming communities surveyed about learning new farming innovations.** Combined, these two approaches account for a solid 75% of responses, with a more or less similar score for each (41% for workshops and 34% for field schools). These figures are considered quite common for general staple farming communities in Indonesia.

**At least 639 farming households are estimated to have adopted business models introduced by the project** (either freshly adopting or scaling up the utilisation of partners' hybrid

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<sup>7</sup> Cut-off date of this impact assessment.

seeds). The numbers are obtained from Syngenta's report of increased sales by 9.3 MT during their partnership with the project. Approximately 2.6 MT of seeds were removed from the equation due to some anomalies and the fact that some extremely large sales (approximately IDR 50,000,000 equalling 2.5 MT of seeds) went to a few farmers with large farms. These large sales equated to 120 kg of seeds to a single farmer which excluded them from the smallholder farmer category (who purchased an average of 10.5 kgs per farmer). With the revised total of approximately 6.7 MT of seeds, it is estimated that 639 smallholder farmers utilised the seeds in Central Sulawesi. As GAP adoptions were rare (less than 4%), these cases were integrated into the seed user groups. The top reason for adopting the project's business model was to get the benefit from the promoted hybrid seed.

**Out of the 639 adopters, only 273 farming households (43%) reported an increase in income from their farming activities.** This is also supported by the qualitative study. There is an assumption here that the increased income (generated solely from the improved yield) is a result of on-farm activities. However, there is also the possibility that some off-farm activities may have had some impact, but may not be well documented or recorded by the project. The project may wish to invest more in the reporting of off-farm activities to calculate their use to beneficiary ratio.

**An income increase of IDR 7 million (A\$706 OR 490 USD) per each beneficiary farming household.** The intervention amassed a total of IDR 1.9 billion (A\$192K) in increased income from all beneficiaries which equates to an average of IDR 7 million (A\$706 OR 490 USD) per beneficiary farming household (273 households, 43% of all adopters). This represents an increase of 265% of net attributable income per household.

**An income increase of 265% is significant. This should support farming households with a better level of usable income for their daily lives, including the needs of men and women.** However, it turns out that male-dominated households and balanced households tended to perform better with an increase in income compared to female-dominated households who more often suffered from a loss. The reason for this would need to be further explored during the regular monitoring.

**The impact assessment suggested that all three CWB requirements: food, health and education have been met in the targeted areas,** confirming that improved income adds greater financial security in terms of CWB fulfilment. There are 137 boys (52%) and 125 girls (48%) who benefited from this intervention.

**Elements of poverty levels could be improved in the intervention.** The targeting of people living with poverty in the intervention left a sizable room for improvement. The following are percentages of project beneficiaries' households estimated as 'poor' under two different poverty definitions:

- \$1.25 PPP 2005 = 4%
- \$1.90 PPP 2011 = 1%

**Business resilience developed.** In the past, maize was proven to be the selected cash crop commodity for farmers' rainy days, or a new alternative income for some rice farmers that were impacted by the earthquake or experienced limited water supplies from damaged dams. The intervention is proven to be adaptive in the current context of the fall armyworm (FAW) outbreak. FAO recognised FAW as an important maize pest which threatens food security and livelihoods in many regions of the world.<sup>8</sup> Working closely with BPTP and PPL in a concerted effort to tackle FAW, Syngenta, with support from World Vision, assists farmers in managing the risks of FAW to their maize farms.

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<sup>8</sup> See: <http://www.fao.org/fall-armyworm/en/>. Based on FAO 2018 estimates from 12 African countries, up to 17.7 million tonnes of maize could be lost annually due to FAW on the continent.

**Most significant change story:**

## **The expensive seed that's worth it!**

For a long time, maize farmers in the Sigi Regency of Central Sulawesi have accepted seedlings donated by the Agricultural Department, even though the results have not been profitable. In fact, many of the farmers have considered this farming to be “voluntary work”, meaning the free seedlings require a lot of work but fail to generate any significant profits.



Hengky Mokoginta used to be one the farmers who sourced his seeds through this donation program. He remembers harvesting approximately 2 tons/ha of dried corn kernels. This only just covered the production costs incurred during the 3-4 month maize growing season but barely generated any profits. With the price of dried corn kernels at roughly 3,200 Rupiah/kg, his total sales were around Rp. 6.4 million.

Hengky, a father of four, came to the area in the 1990s. He started planting maize because of the donated seedlings but then, with the expansion of the cocoa market at that time, he turned to planting cocoa. Unfortunately, this ended in disappointment. Hengky says there was very limited training for cocoa farmers and, today, his trees are no longer productive. “The collectors’ only concern is for the products,” he says. “They don’t care about the farmer’s problems.”

In mid-2018, Hengky was introduced to the MORINGA Project when he agreed to use his land as a demonstration plot for seedlings sold by PT Syngenta, a maize seedlings company based in Pasuruan, East Java. The result was way beyond anything he expected. The demonstration plot produced 12 tons/ha of dried corn kernels – six times more than the donated seedlings!

Not surprisingly, in the next planting season, Hengky did not hesitate in using the seedlings from Syngenta. Although he says they are more expensive than other seeds on the market, he believes they are definitely worth the investment. Previously (like many farmers), he was in the habit of placing 2-3 seeds in each hole because he did not want to risk the seedlings dying. However, with this new hybrid seed, only one seed is needed per hole and the farmer can rest assured that it will grow. This means that 1kg of seeds will now cover a much wider area. The plants are also more productive, with each one producing 2-4 corncobs.

At present, Hengky owns less than one hectare of land but he is now preparing another three hectares which he is renting. He thinks the MORINGA Project has provided him and other maize farmers with an extraordinary opportunity because this program is clearly bringing a lot of benefits. It is not only about the seeds because Syngenta is also providing farmers with good agricultural practice (GAP) information, as well as collaborating in the fight against fall armyworms which are threatening to become a national problem.



Syngenta views the demo plot strategy adopted by World Vision for this project as a good strategy because it enables the maize farmers to see concrete evidence that the seedlings really do produce results. Currently, Syngenta plans to replicate the strategy while continuing to provide assistance to farmers regarding the maintenance of maize.

Relevant departments in Sigi Regency attended the first harvest season and greatly appreciated the synergy between the farmers, the seedling providers and World Vision. In his speech, the Second Assistant of the Sigi Regency expressed his gratitude to World Vision for helping the Sigi community to recover its economy after the disastrous floods in 2019.

Hengky has now also become an intermediary service provider (ISP) with several businesses including a grocery store and agriculture shop. His wife helps him run these shops as well as getting involved in the administrative and financial affairs of his ISP business. For Hengky, family is his priority and he is now able to meet the education needs of his children. Thanks to a high-quality seed and great cooperation between everyone involved, the future is looking a lot brighter.

## Pili nut - East Nusa Tenggara

**The pili nut intervention focuses on building access to markets for pili nut farmers in East Nusa Tenggara.** Its core activities are aimed at encouraging more buyers into the market. It is expected that farmers could sell more and thus improve their income. As the intervention is quite simple and relatively small (120 users, all on the small island of Alor), data and all assumptions were verified to be appropriate based on the impact assessment proceedings and results.

**Seven ISPs actively collected from farmers and sold to their partners,** based on October 2019<sup>9</sup> data utilised for the impact assessment. These ISPs work with private sector partners to establish a sourcing route from smallholder farmers, creating new opportunities for additional income from selling pili nuts.

**The established sourcing model has worked inclusively with women, due to pili nut farming and decision-making power being mostly dominated by women.** This is a result of the indiscriminate nature of the business and confirmed by the fact that 70% of respondents confirmed the presence of adult females during the activity. A strong incentive to endorse women's economic empowerment activities is present in this sector with the level of effort (LoE) in agricultural activities recorded as 67% for females and 33% for males, and decision making (level of control – LoC) recorded as 62% for females and 38% for males.

**In terms of gaining access to markets in pili nut farming, 91% of respondents prefer to deal with ISPs.** The remaining 9% prefer to deal with their farming peers (7.5%) and through farmers' meetings (1.5%). This is understandable as farmers see ISPs as the link between them and the market and an effective way to determine prices and quality standards. There is also a real incentive for ISPs to provide good agriculture/post-harvest practice. Further, regression analysis revealed that most farmers are seeking advice on dealing with the outer hard shells of pili nuts and that the advice given has directly influenced farmers, resulting in the delivery of better quality and larger volumes of pili nuts to their buyers. The study also indicates that the practice of harvesting and selling pili nuts has been adopted by farmers in targeted areas, either with better prices offered by existing buyers and/or with the presence of new buyers. This is in line with the aimed vision for the intervention.

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<sup>9</sup> Cut-off date of impact assessment



**At least 120 farmers have adopted the innovation based on project monitoring activities as per October 2019.** More farmers might have adopted the innovation and may only report in the next reporting period. Similar to maize, the pili nut intervention's impact was seen at farm level with increased quantities and/or products being harvested and sold at better prices. However, there is also the possibility that some off-farm activities may have had some impact but are not yet recorded by the project.

**Pili nut farmers spent a somewhat smaller average of IDR 7.3 million (or A\$726) per adopter household annually.** This highlights a potentially poorer demographic compared to either moringa or maize.

**79% of adopters (94 out of 120 households) in this intervention enjoyed an increase in income as beneficiaries.** The total accumulated income increase for all beneficiaries was around IDR 96.9 million (or A\$9,695). The average increase in income for each beneficiary household was IDR 1 million (or A\$103 OR 71 USD OR 71 USD), with an average increase in revenue per farming household at IDR 1,053,956 (or A\$105).

In the context of child wellbeing, **all three CWB parameters (food, health, education) have been positively affected by the pili nut intervention.** Increased income is expected to provide a greater safety net for CWB in farming households, especially in the face of illness and disease. The project documents 88 boys and 121 girls who benefited from this intervention.

**Approximately 12% of the beneficiaries (40 out of 320 individual farmers) have a household member with some sort of impairment,** which is slightly higher for male members. The impact of increased income is expected to provide these individuals with better options to cope with their impairments – such as the procurement of aid tools, etc. All genders are satisfied with how the intervention has affected workload distribution. Balanced households perform the best with pili nut farming, despite the consistent poorer performance of female-dominated households, suggesting one area of the project where there is room for improvement and possible expansion.

**Elements of poverty have been strategically addressed in the pili nut farming sector** but there is still room for improvement. The following are percentages of project beneficiaries' households estimated as poor under three different poverty lines:

- \$1.25 PPP 2005 = 32%
- \$1.90 PPP 2011 = 14%



**Most significant change story:**

## **The Nut Lady from Nailang**

In the Alor Regency of East Nusa Tenggara (also known as Nusa Kenari) it has long been a practice to collect nuts in the forests as a source of additional income. One of the most popular products has always been the Kenari nut (also known as the pili nut), a tasty, nutritious almond-like nut that can be eaten raw or roasted. The price in the market for these nuts was usually in the region of Rp. 25,000 per kilogram although this would sometimes go up to Rp. 35,000 before the holiday season when there was more demand. However, in the past, demand for the nuts was never consistent enough to get the attention of the commercial

sector. In fact, Kenari nut trees have even been cut down and the wood used as a building material.

Today, the story has changed. Demand for the nuts has risen and so has the price. They now sell for approximately Rp. 40,000 per kilogram or more and this has led to farmers starting to grow the nut trees commercially. "We are happy now that the price of kenari is very good. We can feel the results of the kenari gathering work", said the Dina Coli (F, 54 yo) in Munaseli Village, Pantar Island, Alor District

Veronika Bele Asafa (also known as Voni) is a nut collector from Nailang Village in the Alor Regency. In fact, Voni is more than just a nut collector, she is also an intermediary service provider (ISP) in that she provides the link between the local growers and the buyers. To collect the nuts, Voni cooperates with other collectors who buy the nuts from farmers in the community. This is usually done by collecting the nuts from either the farmers' houses or at an agreed collection point in each village.

Over a period of time, Voni has fostered a number of successful relationships with Kenari nut buyers from outside Alor. This is important for everyone involved in the Kenari nut growing business because these buyers buy the nuts in large quantities on a regular basis, and this keeps the price stable and at a level that is profitable enough for all concerned.

Of course, a major part of Voni's job is to make sure that the quality of the nuts is of a high standard so that the buyers remain satisfied with the product. One of the companies that Voni has a good relationship with is CV Timurasa, a Depok-based company, that processes Kenari nuts into jams and biscuits. If the standard remains high then the buyers are willing to pay a decent price and this includes buyers from Kupang and Surabaya.

The Kenari nuts that are bought from the farmers have had their hard shells removed but still have their skins. Buyers like CV Timurasa require dry peeled nuts meaning the nuts have to go through several processes before they can be sold. First, they must be soaked in hot water so that the skins can be easily separated from the nuts. Then, they must be individually peeled and dried in the sun. Only then can they be sent to the buyer. It's a long process but it has opened up some new job opportunities. For example, Voni now hires between 5 and 10 women whose job it is to peel and dry Kenari nuts.

The one challenge with this process is that it is difficult to dry the nuts in the rainy season and this can become a real problem because Kenari nuts can easily go rotten when there is too much moisture around. To overcome this problem, it was clear that a dryer was needed and this resulted in a partnership between CV Timurasa, the Nirudaya Foundation and LIPI (Indonesian Research Institute) who collaborated on the design of a dryer that would suit the conditions in Alor. In addition to this, another partnership was formed between the Village Ministry and Astra to get funding to build a drying house in Alor and to support Voni with capacity building activities to enable her to run the drying process.

In November 2019, two units of a drying house containing a drying machine were built in Voni's yard in Nailang Village. The launch of the drying facility was attended by representatives from Astra; the Ministry of Village, Development of Underdeveloped Areas, and Transmigration; and the Ministry of Economic Affairs.

Voni sees a bright future for the nut industry in the region. With the ongoing support of the buyers, she can continue to pay the farmers decent prices for the nuts, as well as providing jobs for a team of mostly women in the peeling and drying processes. And it is not only Kenari nuts that Voni is involved with. She has now started collecting cashews as well to meet the demand from CV Timurasa.



## Moringa seeds - East Nusa Tenggara

**The innovation for moringa seeds is considered straightforward and simple (located only on the islands of Timor and Alor, with 228 users).** The innovation involved the introduction of business opportunities to cultivate moringa seed, introducing techniques to carry out the cultivation, as well as developing market access to gain additional income.

**The intervention successfully works with private partners establishing a sourcing route which includes 15 ISPs that actively collect moringa seeds from smallholder farmers and sell to their partners** (as per October 2019 data). These farmers now have a new opportunity to utilise moringa seeds to get additional income. Based on the impact assessment and monitoring, the intervention has helped service providers address the demand in the market.

**Project partners have established a working sourcing model for smallholder farmers in an area that is inclusive towards both genders.** This is shown by the figure where at least 55% of the respondents confirmed the participation of a female household member in the activity. The sourcing model established itself as indiscriminately open to everyone, therefore providing opportunities to both genders. The qualitative study also indicates that women involved in moringa supply chain activities are appreciated socially by their communities. They are recognised as informal leaders that bring cash flow and new knowledge to their communities.

**In terms of preference for information access, moringa farmers show relatively mixed results with a tendency towards a more informal discussion approach.** Only three approaches arose from the study which are: Field school/demo-plot/socialisation at 39%, discussion with peer farmers at 33%, and discussion with ISPs at 28%. 61% of the farmers reported a combination of discussions.

**228 farmers were known to adopt the introduced innovation based on project monitoring activities.** It should be noted that the business model shifted to harvesting and selling moringa seeds instead of leaves. The change reflects changes in off-taker(s) that shifted their demand from leaves to seeds (for oil). In both cases, adoption of GAP was very limited, which is in line with the general shift in the supply chain from leaves to seeds, and limited focus on the dissemination of on-farm agricultural best practices. Interestingly, further regression analysis indicates that growing new seedlings is the GAP practice mostly linked to increased income.

**Role in farming and decision-making power are almost equally distributed at around 50% for most of the activities.** Similar to the maize intervention, the impact of the moringa intervention is a result of on-farm activities such as increasing the quantity of moringa products harvested and sold, although this doesn't rule out the possibility of impacts from off-farm activities that are not documented. There are empowerment activities present in this sector with level of effort (LoE) in moringa farming recorded as 55% for females and 45% for males, and decision making (level of control – LoC) 52% for females and 48% for males.

**90% of adopters (205 out of 228 households) in this intervention have enjoyed an increase in income of IDR 0.6 million (A\$59 OR 41 USD) per household.** The total accumulated benefit from all beneficiaries brought by this intervention is around IDR 120.85 million (A\$12,085). This is derived from an average increase in income of IDR 0.6 million (A\$59 OR 41 USD) and an average increase in revenue of IDR 604,806 (A\$60) per farming household. Moringa farmers typically spent IDR 10.6 million (A\$1,068) on average per adopter household annually, which is considerably lower than those in the maize intervention.

**An interesting fact related to the moringa intervention is that female-dominated households perform the best in contrast to either male-dominated or balanced households.** Despite this, the utilisation of additional income is considered evenly distributed.

**All three CWB parameters have been met through moringa.** Increased income is expected to provide a greater safety net for CWB in farming households, especially in the face of illness and disease. There are 205 boys (56%) and 160 girls (44%) who benefited from this intervention.

**With regards to disabilities, 11% of the beneficiaries (80 out of 709 individual farmers) has a household member with some sort of impairment.** Increased income is expected to provide these individuals with better options to cope up with their impairments – such as the procurement of aid tools, etc. Both genders are satisfied with how the intervention has affected workload distribution.

**Elements of poverty have been strategically addressed in the moringa sector.** About 26% of the beneficiaries in the moringa intervention were estimated as ‘poor’ under the 1.25\$ PPP 2005 poverty line, giving an estimated figure of 52 poor households in total (and around 20 households under the 10% of \$1.9 PPP 2011). The following are the percentages of project beneficiaries’ households estimated as poor under three different poverty lines:

- \$1.25 PPP 2005 = 26%
- \$2.50 PPP 2005 = 89%
- \$1.90 PPP 2011= 10%

**Most significant change story:**

### **For the love of moringa**



Arnold Hermanus, a 55-year-old ex-engineering consultant from Kupang, knew all about the benefits of moringa long before the government started to promote moringa farming. He remembers that it would often be referred to as an “end of the month vegetable” or “the last vegetable to eat” because moringa leaves were a cheap alternative for when the household budget was low or the economic situation was bad. Back in 2014, the former president, Susilo Bambang Yudhoyono, had initiated a program to promote the planting of moringa in NTT. The program was replaced by another program when the next president was elected but by then, Uncle Arnold (as he is known to friends and family) had already fallen in love with moringa.

It was no surprise then that when the MORINGA Project was introduced in 2017, he was keen to be involved and soon became an active participant. He attended moringa training at the Indonesian Moringa Development and Information Centre in Blora and, on his return, immediately got involved in the promotion of moringa cultivation in the community. Although Uncle Arnold had started to grow moringa himself, he was well aware that his own production capacity was not going to meet market demand, which is why he started to encourage other farmers in the area to grow it as well.

Realising the potential to generate a reasonable income, other farmers took his advice and started to grow moringa as well. They weren’t disappointed as they soon discovered that moringa was relatively easy to look after with low production costs incurred from planting to harvesting. The seedlings are obtained from other plants because each tree produces a lot of seeds and there was the added bonus that they require little fertiliser or treatment against pests.

Initially, the growing did not go as smoothly as Uncle Arnold had hoped. The dry weather in NTT meant that the moringa did not grow well at first. However, as soon as the rainy season arrived the crop started to grow and, after 2-3 months, it was already possible to start picking some leaves. The seeds take longer than the leaves which is why Arnold suggests that farmers should consider planting for leaves and seeds in separate clusters. This way the clusters for the leaves can be kept short so that they can be easily harvested every 1-2 months, while the clusters for the seeds can be left to grow tall because the higher the trees the more seeds there are inside the pods.

In 2018, Uncle Arnold saw that not many seeds were being sold by the farmers so he decided to become a seed collector. This meant buying seeds off the farmers and selling them to PT Moringa Organic Indonesia (PT MOI). Sourcing seeds from Kupang, Alor, East Flores and Kupang, Uncle Arnold managed to buy and sell around three tons of moringa seeds in 2018.

“Farmers are now able to experience increased income by selling moringa seed that are wasted along this time. The harvest time for moringa seed is happened on dry season when the other commodity is no longer harvesting so it’s a good timing for farmers” Arnold said.

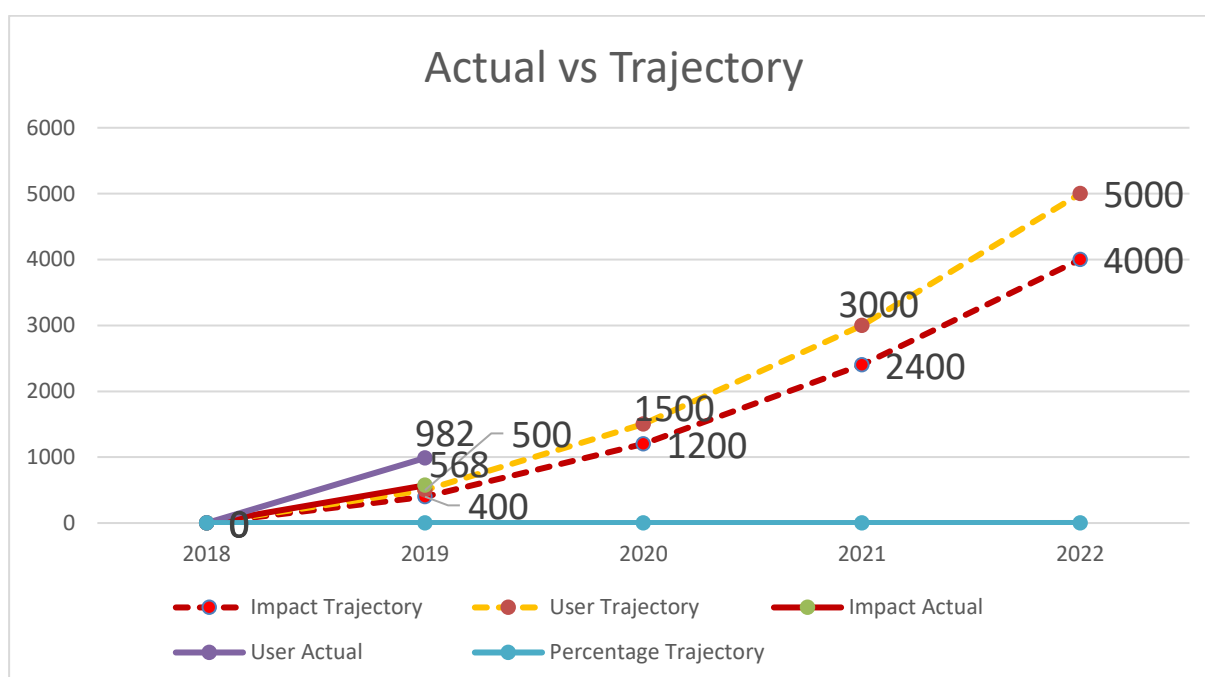
It was in 2019 that Uncle Arnold decided to take the whole process one step further. He wanted to produce moringa oil from seeds but knew what a labour intensive job this was because all the seeds have to be removed from their shells. That was when he realised this was an opportunity to empower some youth labour and he hired a team (paying them Rp. 5,000 per kg) to remove the shells. The next step required him to call on his engineering knowledge. He designed and built a simple oil press to enable him to produce his own oil. It has been working well, needing between 8-10kgs of shelled moringa seeds to produce one litre of oil. So far Arnold has produced more than 30 litres which he has managed to sell. It is another helpful sideline business although Arnold maintains that there is more profit to be made from the leaves than the seeds.

Meanwhile, Arnold has plenty of other innovative ideas involving moringa. Together with his wife, they often try new food processing products using moringa additives. Whether for their own consumption or to sell, they continue to produce a wide range of products including moringa ice cream and moringa cake.

Arnold’s next challenge is to develop a technological innovation to help remove the leaves from the stems, which is a very time-consuming exercise. It sounds like just the right kind of challenge for an ex-engineering consultant who loves moringa!

## Program level

The program is on track with the actual number of beneficiaries slightly higher than the target (572 HH compared to target of 400 HH). Based on the program design document, moringa is expected to achieve 500 users by the end of 2019. Data from the impact assessment found that the total number of users before overlap adjustment is 987 HH. The figures consist of maize (639), moringa (228), and pili nut (120). This achievement exceeds the program's target which is a good indicator that the program is on track to meet its expected goals. In addition, this figure has shown that moringa interventions could work as a good catalyst for respective sectors. Maize and moringa contributed most with 273 and 205 HH respectively, whereas pili nut added another 94 HH. However, there is an overlap (4%) between pili nut and moringa farmers. After the overlap adjustment, the total user number for all three interventions is **982 HH**, and the total outreach number for all three interventions is **568 HH**.



Program performance for goal level indicators are listed below:

Indicator	Total % (& #)	Women % (& #)	Men % (& #)
% of Households with increased incomes	56% of All Adopters	57%.	54%
# of poor women and men with increased incomes (MELF 3.102)	1,711 farmers	896 farmers	815 farmers
Poverty: % of HHs with income below poverty lines: - \$1.25 PPP 2005 - \$2.5 PPP 2005 - \$1.90 PPP 2011	\$1.25 PPP = 16% \$1.90 PPP = 6% \$2.50 PPP = 67%		
Disability: • # farmers with disabilities • # family members with disabilities	198 farmers 44 persons	83 farmers 33 persons	115 farmers 10 persons

Performance at outcome and outputs level is shown on the following project statistics table that summarises key project indicators for three selected commodities/interventions. It may give some insights for the project team as to where to allocate future investments in each commodity as per discussion in Sections 9.1, 9.2 and 9.3.

Indicators	Maize	Pili Nut	Moringa seeds
Poverty rate - \$1.25 PPP 2005	4%	32%	26%
Poverty rate - \$2.5 PPP 2005	43%	88%	89%
Poverty rate - \$1.90 PPP 2011	1%	14%	10%
% HH with Increased Income (User to Benefit Ratio)	43%	79%	90%
# of HH with Increased Income	273	94	205
# HH Users	639	120	228
Net Attributable Income Increase per HH (A\$)	706	103	59
Baseline Income per HH (A\$)	266	81	4
Net Attributable Income Increase % per HH	265%	127%	1655%
Average People with Disability per HH	33%	62%	46%
% Farmers with Disability	11%	12%	11%
Avg. Female Farmers with Disability per HH	13%	20%	15%
Avg. Male Farmers with Disability per HH	17%	22%	24%
Avg. Female HH Member with Disability per HH	4%	9%	7%
Avg. Male HH Member with Disability per HH	0%	11%	0%
Level of Effort Female	17%	67%	55%
Level of Effort Male	83%	33%	45%
Level of Control Female	12%	62%	52%
Level of Control Male	88%	38%	48%
# of Male Children	137	88	205
# of Female Children	125	121	160

## 10. Conclusion

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Based on the impact assessment's objectives and questions as laid out in Section 4, the following conclusions can be drawn:

### **The project increases household income for farming families using the iMSD approach**

Most farmers increased their income, with the highest percentage (of total adopters) delivered by moringa seeds (90%), but in terms of value, the maize intervention has brought the largest increase in income per family.

- Maize: 43% of all the adopters (or around 273 farming households) have benefited from the intervention. On average, each beneficiary generated IDR 7.06 million (A\$706 OR 490 USD) in increased income per farming household.
- Moringa seeds: 90% of adopters (228 households) in this intervention have enjoyed an increase in income as beneficiaries, with an average increase in revenue of IDR 0.6 million (A\$59 OR 41 USD) per farming household.
- Pili nuts: 79% of adopters (120 households) in this intervention enjoyed an increase in income as beneficiaries with an average increase in revenue of IDR 1,053,956 (or A\$105) per farming household.

### **The effectiveness of project partners' introduction and investment in the new business models**

Overall, most project partners provided agricultural information to the farmers, together with various elements of support on the ground that have been identified by the project.

- Maize: Working with ISPs (existing and new) to improve farmers' access is a proven business model. The project's partnership with Syngenta has caused a significant jump in their annual sales from 2 to 9 tonnes. Furthermore, Syngenta's commitment to work with BPTP and PPL in a concerted effort to tackle the FAW outbreak that recently hit the region is a good strategy that is appreciated by farmers, and surely evidence of Syngenta's willingness to sustain the market and support their distributors. FAW is a serious maize insect that can cause significant impact to farm yield, having decreased yields in Ghana and Zambia by between 22-67%.
- Moringa seeds: PT MOI and recently, PT Morifa (both off-takers), have been engaged by the project and are actively promoting agricultural information to the farmers via their collectors to secure their supply of quality moringa (seeds and leaves) from farmers. A facilitated supply chain enhancement via the network of BUMDES is a commonly used strategy that has proven to be effective but may need to be adjusted and fine-tuned for further expansion.
- Pili nuts: Project partners, notably PT Timurasa and CV Pondok Daya, have been playing a significant role in promoting the pili nuts business. Their facilitation with other groups such as government, local NGOs, PT Astra, etc. has been beneficial, having led to new job opportunities for women's groups and the trade of a new commodity (cashews).

**Most significant change story:**

**Partnering with farmers far and wide**



“From 2018 to 2019, PT Syngenta recorded an increase in maize seedling sales from 2 tons to 9 tons, an increase of over 400%” said Jamar Hidayat, Syngenta’s marketing and operational manager for the Central Sulawesi region. This was not only good news for Syngenta but also for the MORINGA Project, a project initiated by World Vision in mid-2017. World Vision had identified Syngenta as one of the project’s key private sector partners (PSPs) particularly when it came to the introduction of a hybrid seed and the promotion of good agricultural practices (GAP) to help maize farmers. As a hybrid seed producer, Syngenta was selected as project partner with the aim of scaling up and boosting the adoption of a hybrid maize variety which was expected to improve maize farmers’ yields and income. The significant increase in Syngenta sales was a clear indication that a lot of farmers had adopted the new seed.

According to Jamar Hidayat, the large jump in sales had a lot to do with the quality of the NK Sumo seedlings. Of course, the first challenge was to prove to the farmers just how superior this variety of seed was. This was no easy feat, especially considering the extensive scope of the project which covered a wide area with many farmers living in remote areas. Jamar says the project provided new players in the area like Syngenta with “an extraordinary opportunity” to reach farmers in these hard-to-reach places.



One of the methods used by the project to demonstrate the quality of the new seedlings to these farmers was to use what they called “demonstration plots”. This involved selecting a farmer in the area and providing them with the new seeds so that they could try them out on a portion of their land. It was a great success because the seeds planted on these plots usually produced harvests that were at least double the size of the yields produced from the usual seeds (donated by local government).

Jamar says he felt for the farmers who had been using these inferior quality seeds for so long because the value of their yields was almost the same as their cost of production meaning all the work they put in was like “doing voluntary work.” A lot of these farmers felt obliged to use these inferior seeds because they had been donated but there was no real profit involved in this kind of farming.

The new NK Sumo seedlings have, however, proved to be a “game-changer”. Of course, it didn’t take long for all the other farmers in an area to notice the increased harvests (and income) generated on the demonstration plots, and it was the new seeds that were requested for the next planting season.

Although it has been worth it for everyone involved, travelling far and wide to organise these demonstration plots is always a time-consuming exercise which is why Syngenta and World Vision have started to consider new methods to promote the use of these hybrid seeds. One idea is to use videos sent directly to the farmers’ phones to disseminate information quickly. As Jamar says, almost every farmer these days has a smartphone that can play videos. Showing farmers the effectiveness of the seeds in a video would mean they wouldn’t have to wait to see the harvest on a demonstration plot. Having this direct connection would be helpful to farmers in other ways as well because Syngenta is also providing a lot of information related to GAP. This information covers everything from planting preparation, fertilising, planting, irrigation, harvesting and pest management.

Up to date information regarding pest management is particularly relevant at the moment as a lot of areas in Indonesia have become infested with fall armyworms, a destructive pest from Latin America that gets into new leaf buds and prevents further growth. Many insecticides have proven to be ineffective with this pest. At present, Syngenta and BPTP (Institute of Agricultural Technology Assessment) and related departments, are still conducting research to find the best way to manage

this pest. This kind of research takes time because each method has to be tested to see its impact on the maize, the environment and other aspects. Syngenta is already providing some guidelines on how to handle this pest. The hope is that a definitive course of action to deal with this pest will be provided to every farmer. With a bit of luck, all they will have to do is check their phones!

### **The extent to which farmers have adopted improved agricultural practices**

The project's success in linking farmers to markets with PSPs and improving market information to farmers has resulted in the adoption of the business model by at least 987 farmers. However, the adoption of GAP and/or good post-handling practices are still lacking.

- **Maize:** At least 639 farming households are estimated to have adopted the project's business model. Farmers typically adopt the utilisation of hybrid seeds, but do not significantly change their agricultural practices. The number of farmers who have improved their GAP application is low (less than 4%).
- **Moringa seeds:** 228 farmers were identified as having adopted the innovation. Farmers mostly adopt the opportunity to harvest and sell moringa-related products such as its leaves and seeds. However, adoption of GAP is very limited in line with the limited focus in its dissemination.
- **Pili nuts:** At least 120 farmers have adopted the innovation. The practice of harvesting and selling pili nuts has been adopted by farmers in targeted areas, either with better prices from existing buyers and/or the presence of new buyers. This is in line with the strategy of the intervention.

### **The extended project partnering with the private sector delivers evidence of impact**

The project has successfully worked with private sector partners in delivering change. However, each intervention has delivered success in different ways.

- Moringa seeds and pili nuts are not a common commodity in Indonesia. Its market is limited and expansion may be limited by this market size. However, the strong features of both interventions are (1) the simplicity of the business model, which brings (2) a simple monitoring/documentation system for the program and (3) increases income for adopters. Based on the SC stories, moringa and pili nuts deliver changes in gender and CWB. This is confirmed by five out of the eight SC stories delivered by the interventions.

#### **Most significant change story:**

### **Sarjan's field of dreams**

When you have only one hectare of land you have to make the most of it. Sarjan, a 40-year-old farmer from the Sigi District in Central Sulawesi, has known this for a long time but for many years the yield from his maize crop could only be described as "average". Using seedlings provided by the local government seed program, Sarjan was only able to produce approximately 2.8 tons of dried corn kernels every growing season. This amounted to a lot of work for almost no profit. Previously, Sarjan had been a rice farmer but he had switched to maize with the introduction of the donated seedlings. After a few years of growing maize, he was beginning to wonder if he had done the right thing.

This all changed in 2018 when Sarjan joined the MORINGA project. He agreed to use his land as a demonstration plot to test the new NK Sumo seedlings from Syngenta and, despite it being a dry season, he produced around 5 tons of dried corn kernels. This attracted the attention of a lot of other maize farmers who were now also keen to use the seeds. For the next planting, all the farmers



in his area used the seeds and, once again, the harvest was a great success. This was despite it being a dry season with limited access to irrigation.

“Not only I get the quality seedlings from Syngenta but also other benefits other such as training on good agricultural practices (GAP), maize business analysis training, and advice on how best to operate as an ISP. With all of this training, I have been able to assist the other farmers. Now, I can save at least 30%, some of which I hope will go towards the tuition fees for my only son who I plan on sending to university. I expect that business will continue to develop to meet the needs of my family and to support the welfare of other farmers in the areas.” Said Sarjan, a 40-year-old farmer from Sigi District in Central Sulawesi.



From then on, Sarjan’s role in the maize business grew. He became an intermediary service provider (ISP) for maize farmers in his area and was soon inviting more farmers to grow maize and sell it to him. Today, Sarjan has 48 farmers supplying him with maize.

Sarjan receives a lot of practical assistance from PT Syngenta. Not only does he get the quality seedlings from them but also other benefits such as training on good agricultural practices (GAP), maize business analysis training, and advice on how best to operate as an ISP. With all of this training, he has been able to assist the other farmers, for example, by selling their corn to large buyers such as animal feed producers. By September 2019, Sarjan was handling over 36 tons of corn sales.

Sarjan’s current challenge is trying to deal with an infestation of the fall armyworm which eats leaf buds and is seriously affecting the maize harvests in his area. He has already tried several methods to get rid of the pest, but so far none have proven effective. He is now trying other treatments and is also hopeful that the relevant government departments will help the farmers overcome this problem.

Meanwhile, Sarjan has plans to expand his business to the Palolo and Napu sub-districts and has already bought a pickup truck to make it easier for him to collect produce from other farmers. Besides using his profits to develop his business further, Sarjan is also making an effort to save at least 30%, some of which he hopes will go towards the tuition fees for his only son who he plans on sending to university after high school. Sarjan expects that his business will continue to develop to meet the needs of his family and to support the welfare of other farmers in the areas. Looking back, he has already come a long way from his one hectare of maize.

- The maize intervention business model is more complex than the moringa and pili nut models, therefore the intervention requires more investment in documentation and monitoring systems. The strong feature of this intervention is its scalability. It delivers (1) the highest value of income increases and (2) the highest number of adopters (double that of pili nuts and moringa). This is also reflected in the SC stories of maize which all focus on the business sustainability of the farmers and ISPs.

This first impact assessment of MORINGA suggests that the project has succeeded in delivering a positive impact towards the targeted communities, with plenty of room for improvement to explore and work on, especially in terms of scaling up and properly monitoring the intervention. In the future, the project could also look more closely at off-farm impacts, especially as there were people with disabilities affected to various degrees by the interventions. It would also be an excellent opportunity to deepen the analysis of the impact on CWB.

## 11. Recommendations for completing the project design

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1. Gender is a key strategy to expand the moringa and pili nut interventions. The quantitative survey indicates a strong case for the contribution of women (level of effort – LoE) and decision-making (level of control - LoC) in the moringa and pili nut farming business. The significant stories collected from both interventions also support the narrative that the intervention has strengthened the social role of women in the community and opened more jobs/income streams for women. A marketing communication strategy, with special emphasis on women, will enhance the production and post-production expansion of the moringa business model. Unfortunately, this strategy may not be applicable for maize as LoE and LoC for females is not that strong.

2. Like gender, the inclusion of people with disabilities is also an important element of all existing interventions with the population of people with some sort of disabilities ranging from 11 percent in maize and moringa to 12 percent in pili nuts. The project may wish to have a program-level strategy that might be useful to help their team tap into this market.

3. The monitoring and documentation in the maize intervention needs to be strengthened to support the case of attribution. Maize brings the highest outreach and income increase to the project, however, the uptake of maize is lower compared to moringa and pili nut, making it less 'pro-poor' in terms of benefit to user. The maize intervention works on a business model that is more complex than the moringa and pili nut models, therefore they need to invest more in capturing their numbers. Improved monitoring and documentation related to the ISPs and their serviced farmers will increase the precision of the reporting process to avoid 'under reporting' and possibly better target poor farming communities.

4. The MORINGA project has been successful in delivering increases in income to many beneficiaries. However, future strategies may need to factor in the following:

- Maize: the intervention work in the conflict prone areas may limit private sector appetite to expand or invest more in these areas.
- Moringa and pili nuts have niche markets which may limit expansion. A better understanding of global/regional markets for moringa and pili nuts may help management to expand these markets.

- New commodities/areas may be required. Given that the expansion of moringa seeds and pili nuts are limited by specific geographic (both are perennial plants) and market factors, as well as the risk of local conflict in Sulawesi that may limit the growth of maize there, management needs to think about the TAM (Total Addressable Market), SAM (Serviceable Addressable Market) and SOM (Service Obtainable Market)<sup>10</sup> of each commodity in the local market. The same applies to any decisions regarding future investment into new commodities/areas that may be feasible in the remaining time of the project.

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<sup>10</sup> <https://medium.com/@artem.albul/start-up-your-startup-properly-tam-sam-som-l33d4d5aeeea>

## 12. Appendices

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- Annex 1: Impact Assessment Terms of Reference



Annex01-ToR  
Moringa Impact Assessment Terms of Reference

- Annex 2: Research design for each intervention



Annex02-Research  
Design.zip

- Annex 3: Questionnaire for each intervention



Moringa%20tools.docx

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