



Rejuvenation of Indonesian Cocoa Farms:
**Boosting Productivity and Sustainability by
Raising Superior Cocoa Seedlings
in Commercial Farmer-led Nurseries**

Sustainable Cocoa Production Program

The Sustainable Cocoa Production Program (SCPP) brings together government institutions, private sector companies, public donors and Swisscontact in a unique public-private partnership to ensure sustainable economic growth in the Indonesian cocoa sector.

SCPP enhances the economic, social and environmental sustainability of cocoa production by implementing complementary development strategies designed to improve the welfare of smallholder cocoa families, meet the demand and quality standards of the cocoa industry, and safeguard the cocoa landscape and its surrounding natural resources. At the Sustainable Cocoa Production Program we aspire to enhance the voice and ownership of women, next to preventing malnourishment in impoverished rural communities.

Our program provides smallholder families, small business owners, farmer cooperatives, young entrepreneurs, and women with the capacity to improve their livelihoods and incomes. We aim at improving the welfare of 90,000 smallholder families through income generation, business development, sustainable farming practices and enhanced financial agency. The program also aims at improving the farmers' access to sustainable markets and to price premiums through internationally recognized certification systems.

Foreword

Close to a million smallholder families grow cocoa in Indonesia. Sadly, if you venture into their cocoa farms the share of diseased, ageing and low-yielding cacao trees is conspicuous. Across the Indonesian archipelago smallholder farmers are experiencing declining cocoa yields, which makes cocoa farming a dubious enterprise. With limited access to quality planting material and investment capital, the smallholder farmers don't have the resources to improve their cocoa production. Too many smallholders are trapped in a cycle of poverty and many are losing faith in the virtues of cocoa production. As a consequence, many farmers have turned their attention towards alternative crops or income sources. Besides, the dubious cocoa yields make the farmers reluctant to invest in their cocoa production.

The challenges faced by the cocoa smallholders are disturbing for the Indonesian cocoa sector, which is threatened by the deteriorating yields, quality and profitability of cocoa. Domestically, the cocoa supply is lower than the demand of the cocoa grinding industry, and inconsistent and low quality beans are traded along the cocoa supply chain.

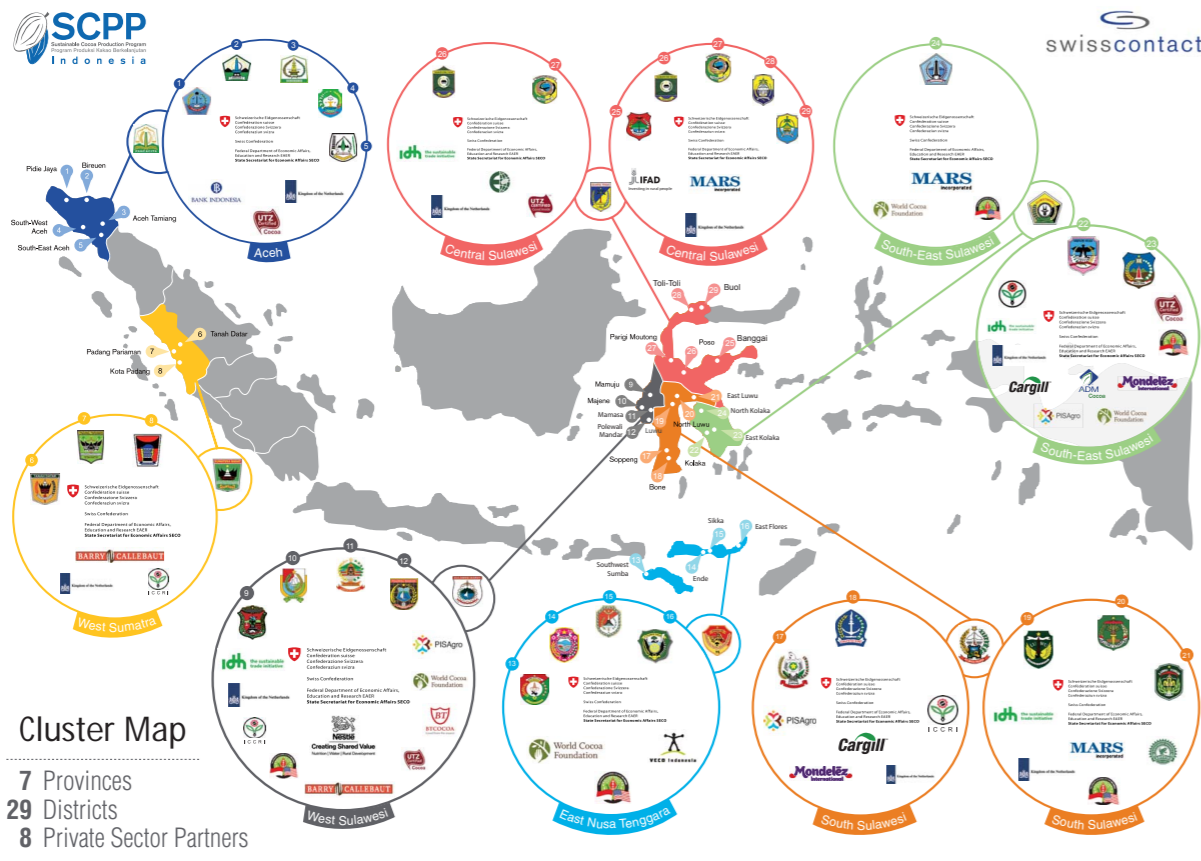
At the Sustainable Cocoa Production Program we see that the future and sustainability of cocoa production in Indonesia will depend on professional farm management and a rejuvenation of the farmers' cocoa farms, but what will that future hold if the farmers don't have access to superior cocoa planting material. SCPP is working closely together with private sector partners and the Indonesian Coffee and Cocoa Research Institute (ICCRI) to disseminate superior planting material and farm rejuvenation techniques to smallholder farmers. By rejuvenating their cocoa farms with high-yielding and resistant cacao varieties the smallholder farmers may be able to double their cocoa yields. A rejuvenated cocoa farm holds the potential to be a promising enterprise that can improve the livelihood of a smallholder family, yet access to superior seedlings and budwood has been limited up to now.

SCPP strengthens the capacity of farmer-led cooperatives, farmer groups and individual farmers to establish nursery enterprises and clonal gardens

SCPP strengthens the capacity of farmer-led cooperatives, farmer groups and individual farmers to establish nursery enterprises and clonal gardens. The establishment of self-sustaining cooperative and individual nursery enterprises can be a scalable means of improving the production and distribution of superior cocoa planting material across the archipelago, which will enable the cocoa farmers to boost their cocoa yields many years ahead. The whole community of cocoa farmers will benefit from the commercialization of the seedling production: the nursery entrepreneurs will generate income from the sale of seedlings, while neighboring farmers will get access to superior and affordable planting material. As such, the program empowers nursery entrepreneurs to reach out to the whole community of cocoa farmers, including disadvantaged and vulnerable groups, with superior planting material.

Beyond an expected increase in cocoa productivity, SCPP strengthens farmer cooperatives and entrepreneurs, enhances the influence and voice of female farmers, and ensures carbon sequestration and natural resource management on cocoa farms and in the adjacent landscape.

This paper provides a remarkable insight into the manifold challenges faced by the cocoa smallholders in Indonesia, and clarifies how SCPP plans to rejuvenate the Indonesian cocoa farms to keep pace with the growing demand for sustainably produced chocolate worldwide.



Discouraging cocoa yields and quality

At first glance, a cacao tree gives the impression of being an alien tree species with its yellow, purple and green pods growing on its stem. These cocoa pods are stuffed with 20-50 ovate or elongated purple beans swathed in a sweet pulp. In this palette of colors there will most likely be black and withered cocoa pods, infested with a cocoa-ferocious pest or disease. Despite the presence of wild boar, monkey and squirrel in the cocoa groves of Indonesia, it is the smaller and hidden creatures that cause the most severe losses in cocoa yields and quality. A closer look at many cocoa pods will reveal small channels in the pod surface and an immature yellowing of parts of the pods. A cocoa pod borer, the offspring of the moth *Conopomorpha cramerella*, has tunneled its way into the pods, where it damages and inhibits the growth of the cocoa beans. When the farmer splits a pod infested with a cocoa pod borer, beans of odd dimensions are clumped together in a hard and decaying mass. These underdeveloped, flat and clumped beans will be harder to dry, fetch a lower price or be completely unmarketable. Besides, many farmers ferment this knot of diseased beans to be able to separate the beans from the placenta material. They sell the beans to local buyers, whereby the diseased beans drift downstream in the cocoa supply chain.

Cocoa farms are demanding to keep, always in the making of becoming dense, which provide the humid conditions in which diseases thrive and pests hide. The severe incidence of pests and diseases in the Indonesian cocoa farms makes cocoa farming a dubious and ambiguous en-

terprise for the smallholder farmers, despite of the promising rise in cocoa demand and prices. The cocoa pod borer alone may cause yield losses above 40%. Vascular-streak dieback has ravaged the cocoa groves in recent years, making trees wither and die, and this disease is now considered the most serious threat by many cocoa farmers. *Phytophthora Palmivora* pathogens bounce from pod to tree to soil, causing black pod disease and stem canker. The yield losses caused by pest and disease attack are disturbing and the prices that farmers fetch for inconsistent and diseased beans are lower. Moreover, it is a burden for the cocoa farmers to combat these intruders, since farmers must regularly remove the infected cocoa pods from the field, prune infested branches and spray pesticides appropriately, among many other pest and disease management practices. Some farmers even cover each cocoa pod with a plastic sleeve to hinder the cocoa pod borer from penetrating it, yet they complain that the sleeved pods get infested with black pod disease.

Many farmers have loosened the reins on the cocoa pests and diseases, since they consider it too demanding to control them. Some farmers have abandoned the worst infested and least productive parts of their cocoa farms, which then become huge nests for the pests and diseases, from where they can disperse to neighboring fields. In recent years, many farmers have even turned their attention towards alternative crops, encompassing oil palm, rubber and corn, which are less demanding to cultivate, yet not more lucrative. Moreover, the dubious cocoa yields

make the farmers reluctant to invest in their cocoa production. Many farmers consider it costly to apply fertilizer to their cocoa farms, despite of the fertilizer subsidies induced by the Indonesian government, or advantageous to apply fertilizer to other crops with a higher return compared to cocoa. As long as their annual economic gains from cocoa production are uncertain and decline, while the input and labor costs keep increasing, the farmers will not risk using their land as collateral to take a formal bank loan to invest in fertilizer, which is needed to increase and sustain the cocoa yields. Nutrient deficiency will make the cacao trees even more susceptible to pest and disease attack over time. A vicious circle is about to close and the farmers are losing faith in the virtues of cocoa production.

Despite 55,000+ cocoa farmers are getting more fruit for their labor after they joined the Sustainable Cocoa Production Program, with their average cocoa yields increasing from 450 kg/ha to 699 kg/ha, many smallholder families still make a meagre living from their low-yielding cacao trees. A cocoa farm holds the potential to produce

cocoa yields of 1-2 ton/ha annually if it's rejuvenated with superior planting material and nourished with professional farming techniques.

The high incidence of diseases and pests is only one of several causes to the poor performance of the smallholders' cacao trees. As a rule of thumb, only a cacao tree with good genetic traits is capable of producing an abundance of cocoa pods bursting with large beans of a high quality. In Indonesia, most cacao trees are low yielding as they have been raised from locally harvested seeds with inferior genetic traits. Additionally, there are many aging trees in the cocoa groves of Indonesia. For the farmers included in the SCPP, the average age of their cacao trees is as much as 16 years. A larger share of these trees are on the verge of their productive age, since a cacao tree's capacity to flower and grow pods usually drops when it reaches 20-25 years. 13% of the trees are unproductive due to aging or disease attack, which is amounting to more than 4.8 million unproductive trees for the SCPP trained farmers alone.

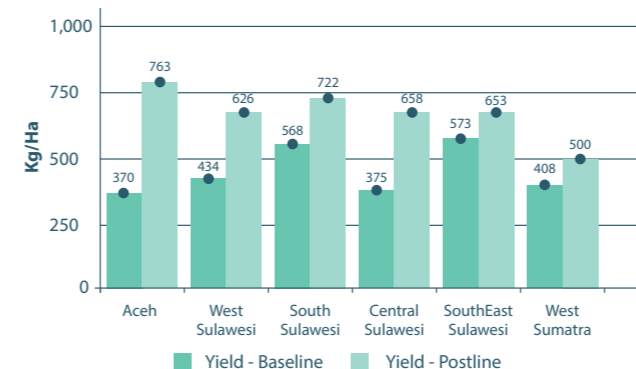


Figure 1: Average cocoa yields before and after participation in SCPP training (based on at least 10% sample).

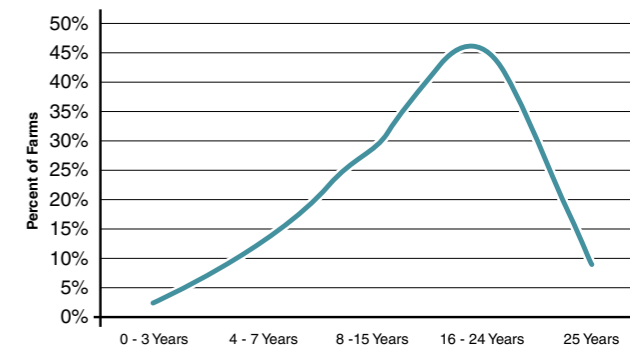


Figure 2: Farm Age Distribution

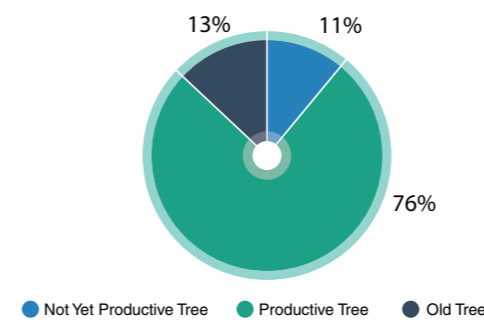


Figure 3: Cacao tree composition in cocoa farms

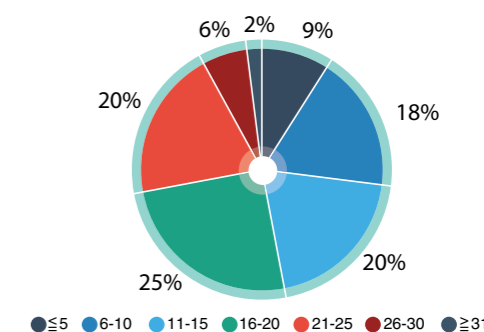


Figure 4: Cacao tree age categories

Improving access to superior cacao varieties

Recognizing the urgent need to enhance the farmers' access to superior cacao varieties, SCPP partners with the private sector and ICCRI to assist farmers in establishing nurseries and clonal gardens comprising of superior cacao varieties.

By maintaining nurseries and clonal gardens in the proximity of their cocoa farms, farmers will be able to draw on the manifold advantages of rejuvenating their cocoa farms with cacao varieties with superior and trustworthy genetic traits. At the Sustainable Cocoa Production Program we encourage the farmers to replace weak or diseased cacao trees with vigorous seedlings, or we encourage them to side-graft healthy and strong trunks of older or low-yielding cacao trees with superior budwood. Moreover, farmers are encouraged to plant cacao seedlings in the gaps between their cacao trees. These farm rejuvenation techniques can lead to improved cocoa yields within less than three years.

Since 2010, SCPP (and its predecessor PEKA in Aceh) has mobilized 1,846 farmer groups, leading to the establishment of 4 clonal gardens, 100 budwood gardens and 392 collective nurseries, which are being maintained by farmer groups and cooperatives. To date, the tangible impact of these endeavors is reflected in the production

of 400,000 superior cacao seedlings. Furthermore, SCPP has trained selected farmer groups and individual farmers in nursery management and clonal garden maintenance, which has resulted in the establishment of an abundance of individual nurseries in the program areas. All farmers in the program have been trained in grafting techniques to enable them to rejuvenate and replace old, diseased and unproductive trees in their cocoa groves.

At the Sustainable Cocoa Production Program we have recently intensified the promotion of nursery enterprises to boost the production and distribution of superior cacao seedlings in the program areas. The aim is to reach an annual capacity of 2 million cacao seedlings.

Seedling by seedling, SCPP aspires to build a sustainable and vital cocoa sector in Indonesia. We have observed that the cocoa farmers seem to be lured by the promising prospects of rejuvenating their old or unproductive cacao trees with superior clones to boost the cocoa yields within a foreseeable future. Thousands of farmers have rejuvenated their cocoa groves in recent years and they are anxiously awaiting the impact on their cocoa yields, which will provide a forecast for the future of cocoa production in Indonesia.

Cocoa propagation

Clonal gardens are often referred to as budwood gardens and comprise of a mosaic of well-recognized cacao varieties. Budwood is a branch taken from a cacao tree and therefore holds the same genetic traits and attributes as the tree it has been taken from. Budwood is used for vegetative propagation of cacao clones with desired traits, where the budwood is grafted onto a seedling or mature tree. When the cambium of the budwood is intimately fused with the cambium of the tree or seedling they will grow together as one plant. The cambium is a thin layer just below the bark that stimulates the growth and healing of the plant. The emerging graft will have the same genetic traits as the mother-tree from which the budwood has been taken. Vegetative propagation or reproduction of a superior cacao clone from a branch of a mother-tree is possible because every cell of the mother-tree contains the genetic information necessary to redevelop the entire tree. In Indonesia, farmers usually harvest budwood for two types of vegetative propagation.



Side-grafting: budwood can be grafted onto the side of healthy and strong trunks of older or low-yielding cacao trees in the cocoa farm. When the emerging superior graft has unfolded its first branches, usually after nine months, the farmer must cut the canopy of the mother-tree to direct the flow of nutrients towards the young graft. Side-grafting can lead to improved yields within two years.

Top-grafting: farmers can graft budwood onto seedlings that have been raised in a nursery. The grafted seedling will be a clone of the mother-tree from which the budwood has been taken, showing the same superior traits. The grafted seedling can be used to replace damaged or diseased cacao trees in the farmers' cocoa farms. Most cacao varieties cross-pollinate, which means that cocoa seeds don't hold the same genetic traits as their mother-tree. It's therefore important to raise a cacao seedling in two stages, initially by planting a seed that will develop into a seedling with a strong root system and, after three months in the nursery, graft budwood harvested from a superior cacao clone onto this seedling.



The clonal gardens also function as demonstration farms that showcase the virtues of superior cacao varieties to the farmers, who hopefully get convinced of the potential of farm rejuvenation by observing what they can achieve and how to get there. Cocoa propagation can at first seem to be a complex phenomenon and the propagation practices aren't necessarily logical for the cocoa farmers. Side-grafting, for instance, involves that farmers cut the canopy and branches of the mother-tree to direct the flow of nutrient towards the developing graft. Farmers who haven't observed the benefits of such a destructive practice are reluctant to cut the flowering, albeit low-yielding, branches of the mother-tree and the outcome is thereby poorly yielding and stunted grafts.

As the superior clones are less prone to pest and disease attack, the share of infested pods in the harvest will decline and thereby make it easier for the individual farmers and cooperatives to comply with the quality standards of the cocoa buyers. Fewer beans have to be discarded as waste material, or as underdeveloped and diseased beans, whereby the farmers will be able to fetch a quality premium by selling to the cocoa manufacturers and procurers in the program.

The farm rejuvenation techniques are not promoted in a void, but in line with a selection of recommended cocoa farming practices, commonly referred to as the Good Agricultural Practices (GAP). To make the cocoa farms reach their full potential, the farmers must enrich and protect the soil, apply fertilizer to strengthen and optimize the performance of the cacao trees, prune their trees appropriately, and reduce the damage caused by pests and diseases by disrupting the lifecycles of these unwanted intruders.



Identifying superior cacao clones and hybrids

The cacao clones promoted by the Sustainable Cocoa Production Program have been screened for their ability to bring high yields, withstand pests and diseases, and produce quality beans. The SCPP has been drawing on research conducted by The Indonesian Coffee and Cocoa Research Institute (ICCRI), the Australian Centre for International Agricultural Research (ACIAR) and Mars, who have been collaborating in the screening, breeding and selection of high-yielding and resistant cacao varieties for years. Cacao clones from cocoa producing countries all over the tropics have been screened for their yield potential, the severity of disease and pest infection, flowering capacity, and their bean quality (bean size, bean count, fat content and shell percentage). These are the important quality indicators in the bulk cocoa market. An example of an advantageous genetic trait is a hard or thick pod surface, thereby making it harder for the cocoa pod borer to tunnel its way into the pod. Further, cacao trees of a small stature are ideal, since they make it easier for the farmers to prune, harvest frequently and remove infested pods from the upper branches.

During the screenings, dozens of cacao varieties have been deemed unsuitable to grow in Indonesia due to their susceptibility to the regional pests and diseases. It was found that most fine-flavor cacao genotypes don't perform well in Indonesia. After the selection of cacao clones with superior genetic traits, hybrid crosses have been developed by crossing paternal trees showing resistance to CPB, VSD or *Phytophthora Palmivora* with maternal trees that bring high yields. Optimal hybridization has been ensured by hand pollination or by cross-pollination in bi-clonal gardens. Lately, the breeding has been concerned with locating genotypes that are tolerant to VSD, which has exacerbated the problems with deteriorating cocoa yields in Indonesia, leading to disheartening losses for the cocoa farmers in recent years. The superior hybrids and clones have thereafter been planted in demonstration plots to observe their performance and adaptability in different local environments.

SCPP field facilitators have evaluated the performance of a selection of cacao clones in clonal gardens in Dis-

trict Cocoa Clinics in Southeast Aceh, Pidie Jaya and Southeast Sulawesi, where they keep track of how each clone adapts to the local environment and soil conditions (see overview of screened clones and clonal gardens at the end of this paper). The promising clones have been distributed to local budwood gardens, which are maintained by the farmer groups and cooperatives. By keeping superior clones in budwood gardens, farmers can observe how each clone develops in the local environment and thereby only harvest budwood from the clones that have gone native and strong.

The promising hybrids and clones currently promoted by SCPP have peculiar code names, such as S1, S2, TSH858, MT and 45. Some clones show resistance to cocoa pod borer, while others have been chosen for their ability to withstand vascular-streak dieback; yet others produce high yields, or large beans with a high fat content. This jumble of superior and inferior genetic traits makes it important that farmers plant several superior clones in their cocoa farms. Moreover, it's important to ensure genetic diversity in the cocoa farm to reduce the risks associated with disease infestation and to ensure ideal pollination. The farmers are therefore encouraged to plant a mosaic of different cacao varieties. This makes a clonal budwood garden next to the nursery very handy.

One of the most promising clones is S1, derived from the name Sulawesi 1, which is a Malaysian clone that has become increasingly popular in Indonesia due to its resistance to VSD, its excellent yields and quality traits. Unfortunately, S1 is known for producing smaller beans with a lower fat content compared to many other superior clones. Another cacao clone, S2, has been promoted by GERNAS, a government program, for years and is renowned for being resistant to CPB, but not as resistant to VSD as S1.

New hybrids are currently being developed and screened by researchers from ICCRI, who attempt to cross clones to make hybrids with superior traits. Sulawesi 3 has recently been released.

¹ ACIAR Report 2014: Improving cocoa production through farmer involvement in demonstration trials of potentially superior and pest/disease resistant genotypes and integrated management practices.

² Illustrations of the clonal gardens are provided at the end of this report

Inclusive and entrepreneurial program

At the Sustainable Cocoa Production Program we aspire to be inclusive and to support entrepreneurship. We encourage individual farmers, farmer groups and farmer cooperatives to set up commercial nurseries that produce and distribute cacao seedlings of high quality. The only criteria are that the farmers are motivated and skilled to run a nursery.

To empower the farmers to produce their own cacao seedlings reduces their dependency on governmental seedling distribution programs and private seedling suppliers. Moreover, in the remote farming communities, farmer-led nurseries are the main source of cacao seedlings and thus the key supporters of farm rejuvenation and afforestation activities.

The cocoa farmers are initially trained in groups of 25-35, where the farmer group functions as a knowledge-sharing and learning platform. Field facilitators train the farmers in the recommended grafting techniques and provide guidance on how to establish and maintain a nursery. Prior to the training and the establishment of the nurseries in the program areas, most cocoa smallholders were unfamiliar with the economic potential of rejuvenating their cocoa farms and the recommended techniques. Moreover, by training the farmers in groups, SSCP disseminates knowledge of cocoa propagation and nursery maintenance to a large share of the farming community.



7.5 USD A grafter usually earns per day	150 Cacao Seedlings per day
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Well-functioning farmer groups are encouraged to establish a group nursery, partly financed by the Sustainable Cocoa Production Program. Alternatively, the farmers can choose to establish a private nursery or become engaged in a larger nursery managed by a farmer cooperative. The farmers are expected to contribute to group nurseries with enthusiasm, curiosity, knowledge, labor and small financial contributions. Field facilitators and key farmers are responsible for guiding the management of the group nurseries. Key farmers have been critical to the success of the nurseries, since they have been trained substantially to take the lead in organizing the farmers and make sure that the day-to-day operations of the nurseries are professional, efficient and gender inclusive.

SCPP aims at commercializing the farmers' production of seedlings, which will benefit the whole community of cocoa farmers. Many farmers are now unfolding as commercial nursery entrepreneurs, who gain economically from raising superior cacao seedlings in private or cooperative nursery enterprises. They use the cacao seedlings for reju-



venation and replanting purposes in their own cocoa farms and sell seedlings to farmers in the adjoining villages. The nursery entrepreneurs use the surplus from the sale of seedlings to invest in fertilizer, to pay for their children's education, to set aside on savings accounts, or to upscale their nursery enterprises. Neighboring farmers get access to affordable seedlings of high quality and no longer have to suffice with poor seedlings, which have been raised from seeds of dubious quality and seldom grafted. Currently, a larger share of the seedlings is sold to government agencies that distribute the seedlings to farmers in other parts of the respective provinces.

The group nurseries established by SSCP have shown promising achievements in the first couple of years, but many farmers prefer to run their private nurseries next to their cocoa farms, some to meet their personal needs for seedlings, while the most entrepreneurial among them succeed as private nursery entrepreneurs. We have recently observed a transition from group nurseries to an abundance of private nurseries in the program areas, which are operated by a single farmer or by a small group of relatives or friends with a mutual vision. We can only expect that many of the group nurseries disband after a couple of years when they have achieved their primary

objectives: to supply quality seedlings to their members and to disseminate know-how of cocoa propagation to the farming community.

The private nurseries apply superior planting material that has been fostered in clonal gardens maintained by a farmer group, farmer cooperative or District Cocoa Clinic in their proximity. As such, the support institutions established by the Sustainable Cocoa Production Program serve as the nucleus of a network of private nurseries and play a critical role in the evolution of these. They function as learning and resource centers that develop and disseminate superior planting material and know-how to local nurseries. They can also be a hub for other collective activities and, among others, serve as collection and marketing points, or as centralized post-harvest stations.

It's not only the members of the farmer groups that run their private nurseries now, since their neighbors have begun to establish their own small nurseries, often by drawing on the expertise of the skilled farmers. The experienced farmers are often hired as grafters by their fellow farmers. A grafter usually earns IDR 90,000 (approx. 7.5 USD) for grafting 150 cacao seedlings, which should be feasible in an afternoon.

Strengthening cooperative nursery enterprises

The Sustainable Cocoa Production Program has continuously encouraged farmers to run larger nurseries in a farmer cooperative, known as Smallholder Cocoa Enterprises (SCE). Each Smallholder Cocoa Enterprise is an umbrella of several farmer groups that get together to draw on the advantages of collective innovation. The cooperative enterprises are usually established on the initiative of enthusiastic key farmers or well-functioning farmer groups, who form an enterprise board. Farmer groups are gradually included in a cooperative to ensure the transition into a self-sustaining enterprise. However, only well-organized farmer groups are encouraged to join a cooperative. Moreover, the Smallholder Cocoa Enterprises are linked to District Cocoa Clinics and governmental Gabungan Kelompok Tani that channel support services to the cooperatives.

SCPP has recently intensified the support to motivated farmer cooperatives to improve the services they deliver to the farming community. Next to producing cacao seedlings, Smallholder Cocoa Enterprises may offer grafting services or help farmers rejuvenate their farms, which supplements the income of the cooperatives. Some farmer-led enterprises also sell compost in excess. Moreover, if private program partners show an interest in buying cocoa from the SCE, either certified or non-certified beans, the cooperative will ensure proper fermentation (if required), adequate drying, bean quality control and compliance with certification standards, which in turn leads to price premiums for the farmers.

At the Sustainable Cocoa Production Program we have acknowledged that to equip the farmers with know-how, financial support and nursery equipment is just a tiny step in the formation of a cooperative nursery enterprise. Several challenges must be overcome to ensure the transition into a self-sustaining joint business. We know that only

positive group dynamics and mutual trust will ensure the dedication of the coop-members to a mutual vision. SCPP strengthens the cohesiveness of the farmer cooperatives and educate the farmers in how to take advantage of working together, both when it comes to overcoming financial shortages, ensure democratic decision-making, and to coordinate the day-to-day operations of their enterprises.

Some farmer cooperatives embrace the major potential in working together, whereas others remain hesitant due to their inexperience with collective entrepreneurship. Mutual trust is the cornerstone of a well-organized cooperative and it remains a challenge to bring farmer communities together in a culture where it's uncommon to be organized beyond the village and blood lines. Moreover, as soon as money gets on the table from the sale of seedlings, the trust to the financial managers drops, which is caused by the farmers' previous experiences with corrupt authorities. Indonesia has a history of systemic corruption, making corruption partly accepted at the village level.

The promising collective enterprises are drawing on existing cultural forms of collective deeds, such as “*arisan tenaga*” or “*gotong royong*”, where the group members help each other prune or rejuvenate each farmer's cocoa farm. The joint efforts reduce the labor burden for each farmer, ensure mutual knowledge-sharing and strengthen the coherence of the group.

Traditional farming habits are persistent and we have realized that it's not entirely advantageous to expect of farmers to work together in cooperatives. Collective action is uncommon in some regions, which makes the farmers hesitant to commit to a common vision, since it requires that they change their farming habits and mindset to engage in unfamiliar forms of social practice. In these regions farmers usually prefer to manage their land alone and individual nurseries may be more ideal under such circumstances. By promoting individual as well as cooperative nurseries, SCPP acknowledges that collective innovation has several advantages, but that it doesn't work in all settings.





Women as business owners and decision-makers

SCPP aspires to advance the influence and voice of women in the farming communities by enhancing the responsibility of women in collective decision-making processes and their ownership of income-generating activities. Inclusion of female key farmers in the decision-making processes in the farmer groups and cooperatives has been a major priority so far. In the ongoing pursuit for gender equality, SCPP stays sensitive towards traditional working roles in the smallholder families to ensure a sustainable transition towards greater equality. Cocoa farming is a family enterprise with members of the family playing different roles in cocoa farming, post-harvest handling, marketing and management of the household income. It's common in Indonesia that men are responsible for the maintenance of the cocoa farms, while women take care of the households and post-harvest handling.

At the Sustainable Cocoa Production Program we are confident in that women have a role to play as entrepreneurs that provide support services to neighbor farmers

and the cocoa sector by operating nursery enterprises or centralized post-harvest stations. When it comes to the maintenance and economic activities of nursery enterprises, SCPP promotes that women and men are equally involved. The target on minimum 20% female participation has been met so far, with an average of 19% female cocoa farmers registering in the program.

Furthermore, women must be given the chance to unfold their voice and potential as decision-makers in farmer groups and cooperatives, even though it remains a challenge to involve women in formal decision-making due a social hesitancy that stems from patriarchal norms in the communities. Female participation is considerably higher in West Sumatra compared to Sulawesi, which is spurred by cultural differences. To empower women's position, SCPP promotes gender equitable cooperative development by drawing attention to the role women can play in improving the communities' wellbeing through their participation in income-generating activities.

Startup support, financial access and self-sustaining growth

The nurseries rely on support from SCPP and membership fees to finance the startup investments. To give the nursery enterprises a head start, SCPP provides polybags, water pipes, transparent roofs, fencing net, fertilizer and planting material from several superior clones during the first year of establishment. The farmers have to pay for the construction material, such as poles and wood, and the soil for the polybags. The groups collect membership fees to pay for the construction material and soil, but usually only in the first season. There is no need to hire labor for the construction of the nurseries, since the farmers build the nurseries themselves. The nurseries are expected to become self-sustaining as the seedling sale begins. SCPP has recently developed a commercial nursery manual to guide the farmers through the challenging process of starting up a nursery enterprise, which involves several financial and administrative steps that the farmers are unfamiliar with.

SCPP promotes a standard nursery of the size 6m x 9m, which has the capacity to produce 1,500 cacao seedlings each season, amounting to 3,000 seedlings annually for each nursery. Usually up to 20% of these seedlings are sold, while the major

share of the seedlings is used by the farmers themselves for rejuvenation and replanting purposes. At the outset, the farmer group identifies how many seedlings each farmer in the group needs for the upcoming season. Each farmer gets 100 seedlings for free in the first season.

The Sustainable Cocoa Production Program provides training in financial literacy, which will strengthen the farmers' capacity to manage their farms and nurseries as small businesses by preparing investments plans and determining financing needs. Moreover, linkages between farmers and commercial banks are about to be established and formalized in order to provide flexible financial products that are suitable for the cocoa farmers. Well-functioning farmer cooperatives can also provide financial services to their members by inaugurating cooperative savings accounts or by cooperating with microfinance institutions. Access to savings and lending schemes will enable the farmers to upgrade their cocoa production through investments in seedlings, fertilizer and enterprise facilities. Additionally, savings or loans can compensate for the farmers' periodical loss in income in the first two years after farm rejuvenation.

The ongoing support to financial schemes, nursery enterprises, farmer cooperatives, and District Cocoa Clinics will hopefully lead to self-sustaining growth in the cocoa supply chain as these entities build up the capacity to deliver long-term services to the cocoa farmers in the form of cacao seedlings, budwood, fertilizer, compost, investment capital and centralized post-harvest handling. The nursery enterprises must generate sufficient revenue to sustain their activities, which partly relies on their success on the market for cacao seedlings.

6m x 9m

Standard
Nursery Size

1,500

Cacao Seedlings Capacity
Each Season

3,000

Seedlings Annually
Each Nursery

20%

Seedlings
Are Sold

Nursery entrepreneurs navigate in a distorted seedling market

A cacao seedling must have a healthy root system to develop into a healthy cacao tree. The seedling must be raised in a polybag of an appropriate size to avoid that the seedling develops root deformities, such as a bent, twisted or deformed tap root, which will retard the growth of the cacao tree throughout its entire lifetime and may cause the tree to lean or fall over.

The Sustainable Cocoa Production Program found that if the farmers invest in nursery equipment, polybags and soil, the price for a quality cacao seedling amounts to IDR 6,000 (approx. 0.5 USD). This is a fair price for a quality seedling that has been raised in a large polybag of the size recommended by SCPP. Sadly, this price is currently not competitive in some regions due to the interference of the government on the seedling market. Government agencies distribute seedlings of a lower quality to farmers for free, thereby reducing the demand for seedlings locally and generating a lower market price for seedlings. The government agencies are highly interested in buying the seedlings produced by the nursery enterprises, but they are only willing to offer IDR 3,000 (approx. 0.25 USD) per seedling.

The government's quality criteria for seedlings are lower in that they prefer if seedlings are raised in smaller polybags, making the seedlings easier and cheaper to distribute. It has been a challenge for the farmer-led

nursery enterprises to succeed on the distorted seedling market. Several Smallholder Cocoa Enterprises in Aceh and South Sulawesi are complaining that they can't make enough money from their seedling sale to upscale their nursery enterprises. The government agencies are only distributing seedlings in some areas, but farmers in other areas are now awaiting free seedlings. The limited market demand for seedlings results in low returns for the nursery enterprises and makes it hard for them to invest in their businesses. If the nursery enterprises aspire to take part in the seedling market they are pushed to produce seedlings of a lower quality, not least to keep their investment costs low. This makes it impossible for the nurseries to produce quality seedlings for a competitive price. When that is said, in other regions the market for seedlings is much more promising. In some regions the nursery enterprises sell seedlings for IDR 5,000 (approx. 0.42 USD) to group members and IDR 7,500 (approx. 0.63 USD) to neighbor farmers.



the nursery enterprises sell seedlings

IDR 5,000
Group Members

IDR 7,500
Neighbor Farmers

Raising superior cacao seedlings

To raise a superior cacao seedling involves careful and attentive nourishment. Cocoa is unique in that the seeds can't be stored. The seeds must be harvested from a cacao tree with vigorous genetic traits, such as an upward-growing stem, strong root system and less susceptibility to diseases.

After being scooped out of the pod, the seeds must be sorted according to their size and quality, pre-germinated, and planted in polybags of an appropriate size to allow the tap root to seek downwards like a carrot. If being tucked into a small polybag, the roots of the developing seedling will respond by coiling at the bottom or begin growing upwards, whereby they will form knees and loops inside the bag. If available and costs allow, polybag sizes of 20 x 30 cm or 25 x 40 cm are recommended. These apply for seedlings that will stay in the nursery for six months. Black polybags are recommended, since clear bags will stimulate algae growth. The polybag must be stuffed with a healthy soil, enriched with well-decomposed organic matter to make it easy for the roots to absorb water, oxygen and nutrients. Farmers can produce their own compost for this purpose. Moreover, the roots will suffocate if there is no proper drainage. Polybags with holes are therefore preferred or otherwise holes must be punched in the bags.

As the cotyledons emerge and the seedling develops, water, shade and nutrients must be applied according to its daily needs. Diseased seedlings must be removed from the nursery to avoid disease pathogens bouncing from one seedling to another. Too much shade will make the seedlings grow tall and skinny, whereas the leaves will get scorched and wither if the seedlings are exposed to too much sun.

After three months in the nursery it's time to top-graft the seedling. Budwood must be harvested from a plagiotro-

pic or fan branch of a superior cacao clone, which has been found to bring high yields and showed resistance to diseases and pests. The tree must have shown an ability to withstand infection by *Phytophthora palmivora*, cocoa pod borer, vascular-streak dieback and the jumble of peculiar diseases that are prevalent in the cocoa groves of Indonesia. If farmers want to sell their seedlings they must harvest budwood or seeds in clonal gardens or farms certified by the government, which grow cocoa clones certified by ICCRI. In reality, farmers can also buy seeds or budwood from private seed suppliers who run certified enterprises, but who don't necessarily get their products from certified clonal gardens.

Polybag Sizes Recommended



20 x 30 cm or **25 x 40 cm**

Safeguarding the cocoa landscape and surrounding forests

The Sustainable Cocoa Production Program aspires to safeguard the landscape in which the smallholder families live and their cacao trees grow by promoting sustainable farming practices, carbon sequestration and natural resource management. For the upcoming years, SSCP will encourage farmers to integrate beneficial shade trees in or along the borders of their cocoa farms, next to increasing the density of cacao trees per hectare. The farmer-led nurseries will play a key role in these endeavors.

Farmers are encouraged to plant cacao seedlings in the gaps between their mature cacao trees, where sunlight makes weed flourish. The average number of cacao trees per hectare is currently on 777, whereas the optimal number would be close to 1,100.

Program region	Average of cacao trees/ha	Average of shade trees/ha
Aceh	700	51
East Nusa Tenggara	603	172
West Sulawesi	737	110
South Sulawesi	826	54
Central Sulawesi	807	55
South-East Sulawesi	837	112
West Sumatera	617	103
Averages	777	62

Cocoa is an environmentally-friendly crop in that it grows well in diverse agroforestry systems that provide critical ecosystem services, such as a habitat for native wildlife, protection of watersheds and prevention of soil erosion. Mature cacao trees grow well under 10-35% shade, while cacao seedlings need up to 60% shade in their early growth stage. Farmers can diversify their income sources by integrating beneficial shade trees on their cocoa farms, while fruit trees will add nutrition to the household diet. By applying optimal agroforestry design, farmers can increase their cocoa yields, while desirable shade trees will ensure nutrient recycling, soil protection, wind barriers, provide organic matter and make the cacao trees

less stressed. A higher density of cacao and shade trees ensures that the soil is protected from heavy rain and erosion. As the leaves of cacao and shade trees drop, form a mulch layer and decompose they will enrich the soil with organic matter, which will improve the availability of nutrients, oxygen and water in the soil. Organic matter optimizes the growing conditions for the root system, which strengthens the cacao trees and makes them less susceptible to diseases. The farmers can intercrop their cacao trees with leguminous species that have an innate ability to pull nitrogen from the air, which become available in the soil as their leaves and roots decompose.

Cacao-agroforestry systems can also sequester a huge amount of carbon, which is stored in the trunk and root system of the cacao and shade trees. To increase the number of cacao and shade trees will therefore contribute to the reduction of atmospheric carbon and positively to the mitigation of climate change.

In general, a higher return to cocoa production will hopefully reduce the pressure on the surrounding landscape as well. An increase in cocoa yields may prevent farmers from converting to crops with a higher carbon footprint, most importantly oil palm, which can have negative environmental impacts by draining water and soil resources. Furthermore, a rise in the productivity of the existing cocoa landscape will hopefully make the farmers less inclined to encroach into high-biodiversity and carbon-rich protected forests to expand their agricultural land area and supplement their income. The ongoing rejuvenation of the existing cocoa landscape will expectantly relieve the pressure on the surrounding forest and water resources, which would ensure continual carbon sequestration through avoided deforestation and land degradation. Land degradation and unsustainable land use practices will otherwise threaten the next generation of cocoa farmers' ability to sustain economic growth and improve their wellbeing. An analysis prepared for the World Cocoa Foundation's program in West Africa showed that while greenhouse gas emissions per hectare increase in an intensified farming system, caused by the increase in fertilizer use, the net impact is a reduction in greenhouse gas emissions at the landscape level due to the prevention of deforestation.

At the Sustainable Cocoa Production Program we believe that sustainable cocoa production is a scalable means of improving the livelihood of smallholder families, meeting the growing demand for sustainably produced cocoa, contributing to the mitigation of climate change, preventing land degradation, and safeguarding diverse ecosystems.



784
The average Number
of Cacao Trees
per ha

up to
1,100
Optimal Number
of Cacao Trees

A man wearing a white cap with a 'Cocoa Plant' logo and a blue polo shirt is smiling and holding a young cacao seedling. The background is a lush green nursery.

A nursery entrepreneur

Muhamad Nasir

Motivated by the opportunity to supplement his income and empowered by the know-how he had gained during his participation in the Sustainable Cocoa Production Program, Muhammad Nasir decided to invest in a nursery enterprise. He based his decision on the growing need for superior cacao seedlings and improved guidance on farm rejuvenation techniques in his village, Salukayu, in West Sulawesi.

MUHAMMAD NASIR (30) was introduced to cocoa farming in 2004 by a friend. Back then he planted 450 cacao trees on 0.75 hectares of land. "At first I experienced encouraging yields from my cocoa farm, but over time the yields started declining for each harvest. Diseases, such as vascular-streak dieback and cocoa pod borer, were spreading widely and damaged my trees and pods. I began doubting if cocoa farming was profitable for me."

In 2013, Nasir participated in a Farmer Field School organized by SCPP. During the training he was chosen as the head of the farmer group, Simbar Allo. During a 10-days training session, Nasir and the group members received guidance in nursery management and farm rejuvenation techniques. Nasir soon recognized the great economic potential in rejuvenating the low-yielding cocoa farms in his village with superior cacao clones.

"Before I joined the training, I had replaced some less productive cacao trees with local seedlings, but most of them died," says Nasir. "Farmers in my village have almost lost their faith in cocoa farming, so during the training I was particularly interested in the top- and side-grafting techniques that I can use to rejuvenate my cocoa farm. It's important that there are

seedlings available for replanting - therefore the field facilitator encouraged my group to establish a nursery. It was difficult to convince the other group members to run a nursery together, so I eventually decided to build my own nursery."

Nasir borrowed money from a relative to invest in equipment for the nursery. SCPP provided a UV plastic roof and shade cloth for his 117m² nursery. He bought wood, polybags and fertilizer himself. As soon as Nasir had the first bundle of top-grafted seedlings ready for transplanting, his neighbors started buying seedlings for their cocoa farms. "So far I have sold 3,000 top-grafted seedlings, paid back my loan, and made a profit of about IDR 15,000,000 (approx. 1,250 USD). The demand for cacao seedlings is still surprisingly high, even within the boundaries of my village," Nasir states.

Currently, Nasir's village suffers from extended periods of drought. However, Nasir is not worried about his nursery business. He waters the seedlings daily and ensures that he applies the recommended practices in the nursery. "My nursery is not only useful for me; I can also help other farmers. They can buy seedlings and pay them later after the harvest season. Together we can achieve a higher quality and a good income."

A man wearing a white cap with a 'Cocoa Plant' logo and a dark t-shirt is smiling and holding a young cacao seedling in a black plastic bag. The background is a nursery with a blue netting structure.

Cacao seedlings and supplemental income to farmer group

Rusnadi

The members of the Padang Utama farmer group don't have to buy expensive cacao seedlings from external suppliers anymore, since they produce their own high-quality seedlings now. Besides, they have been able to sell 1,000 top-grafted seedlings to non-member farmers and have made a profit of IDR 4,500,000 (approx. 38 USD) so far.

Padang Utama farmer group, based in the village Peuweang in West Sulawesi, was established during a Farmer Field School organized by Swisscontact and Nestlé in 2013. During the training, Rusnadi (40 years) was a remarkable and enthusiastic farmer and he soon acted as the leader of the farmer group, supervising 31 of his fellow cocoa farmers.

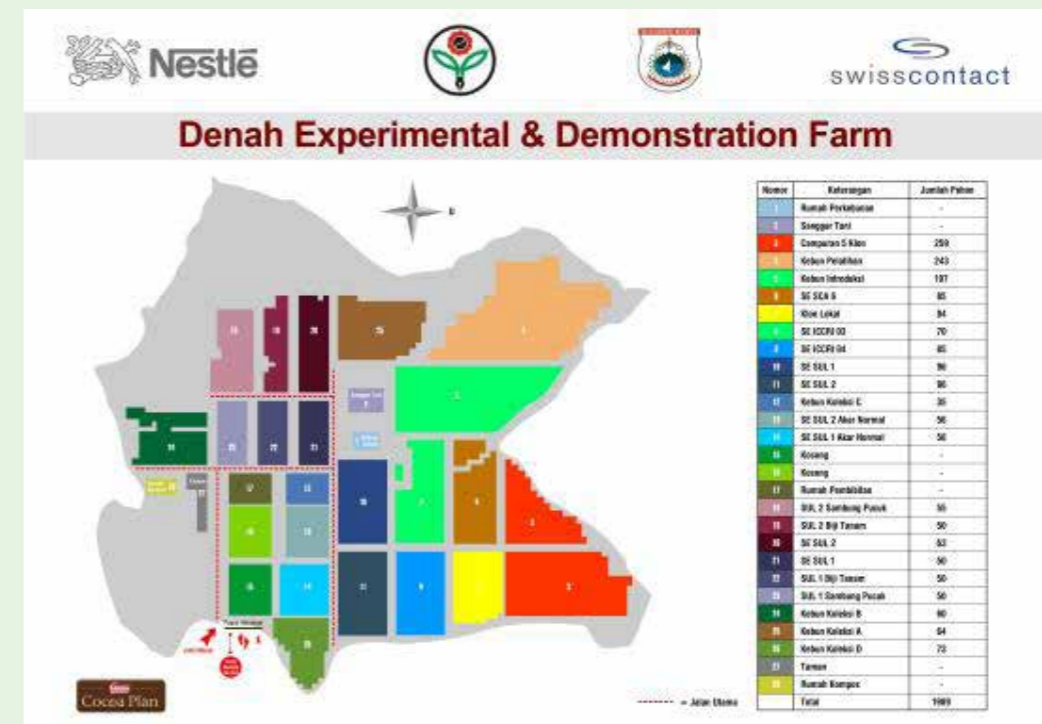
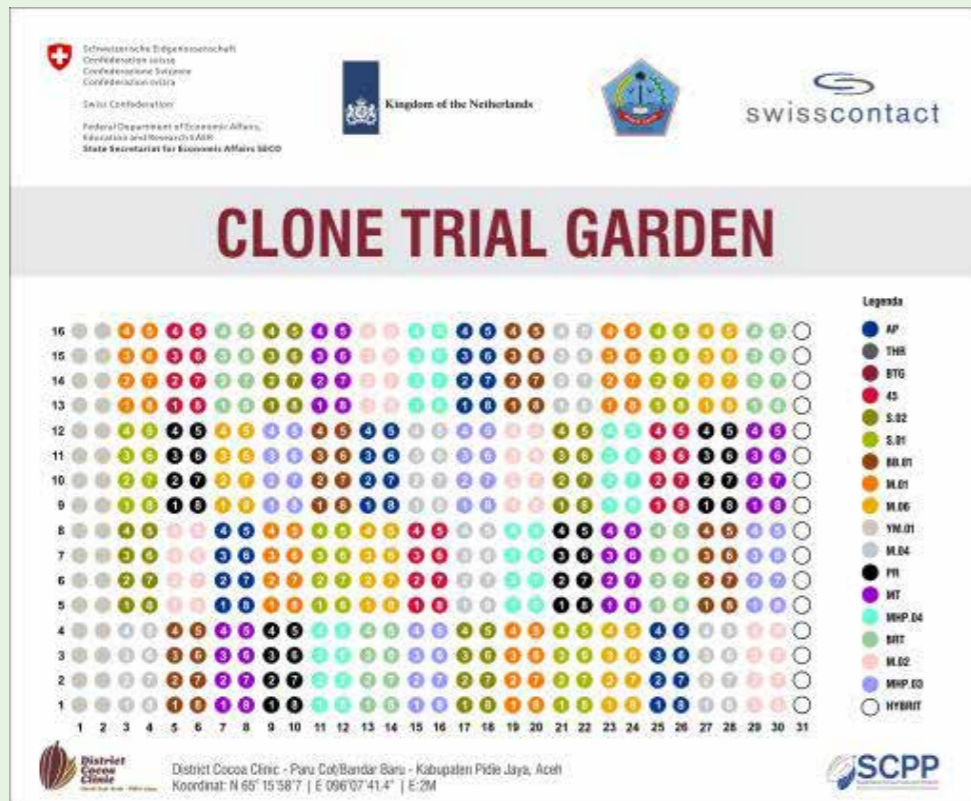
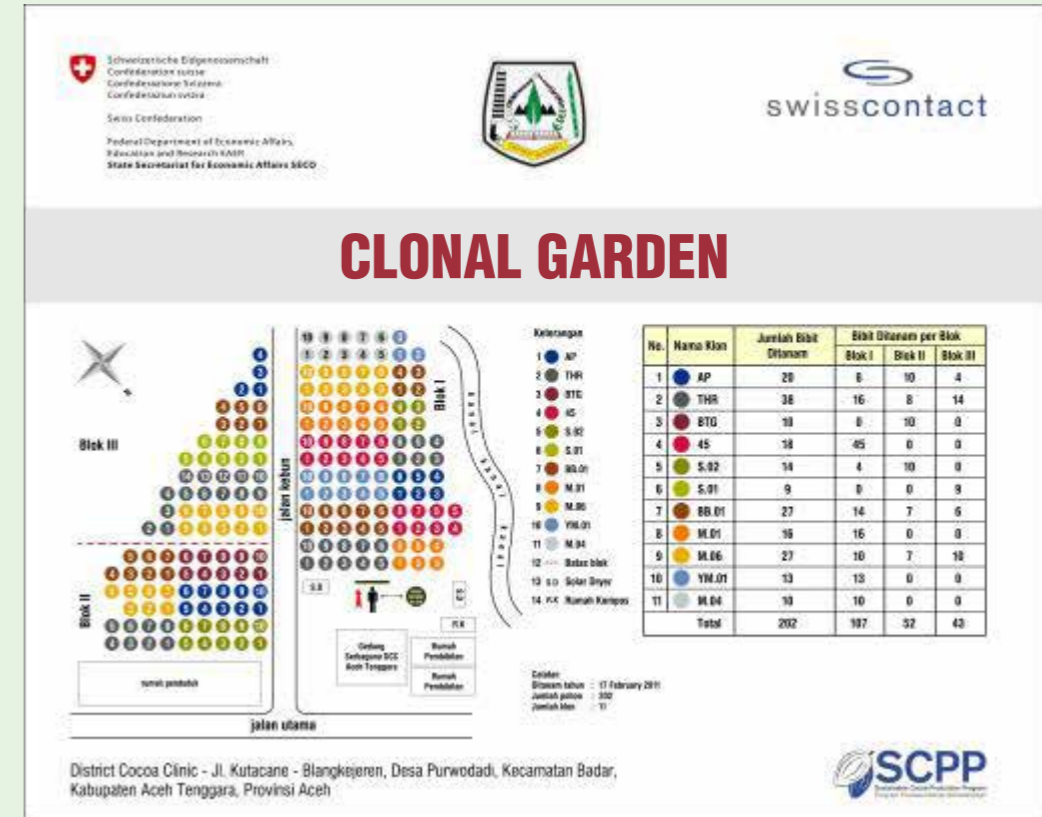
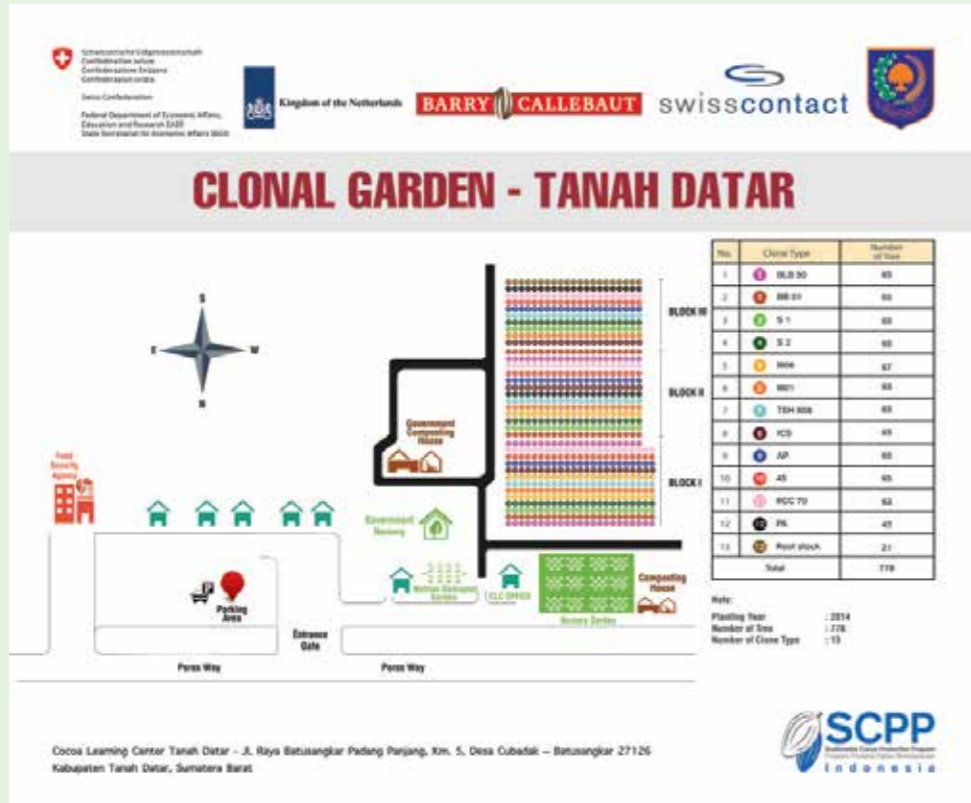
Rusnadi remembers when he planted cacao seedlings for the first time - in his family's cocoa farm together with his parents 30 years ago. He now owns two hectares of cocoa, comprising of about 1,000 cacao trees. Sadly, the incidence of vascular-streak dieback has been severe in recent years in West Sulawesi, leading to a decline in cocoa yields. "In these precarious circumstances, I heard that the Sustainable Cocoa Production Program would arrange a Farmer Field School in my village, providing training to cocoa farmers. I believed that such a development program could bring huge benefits for the cocoa farmers in our village," says Rusnadi.

However, it was not an easy start for the inexperienced farmer group. In the beginning, Rusnadi's group applied fresh goat manure to the cacao seedlings instead of applying the rec-

ommended fertilizer types and dosages. As a consequence, all the seedlings died. Currently, much toil and cooperation is required to reduce the damage from caterpillars and to water the seedlings daily in the dry season. Unfortunately, only six group members have shown perseverance and are actively working together with Rusnadi in the maintenance of their nursery. However, they still manage to produce 2,200 seedlings annually. They have already raised 1,200 seedlings for their own cocoa farms and sold an additional 1,000 top-grafted seedlings to other farmers, which amounts to a profit of about IDR 4,500,000 (approx. 38 USD).

"I can daily apply what I learned during the Farmer Field School. I recall the lessons in Good Agricultural Practices, such as PsPSP (Frequent Harvesting, Pruning, Sanitation and Fertilizing), which in my experience is highly effective to reduce pests and diseases that attack our cocoa farms" Rusnadi explains. "I deeply thank Swisscontact and Nestlé for the beneficial Farmer Field School and Nursery Program in my village. I hope that this program will continue providing guidance to farmers in sustaining their cocoa production and thereby improving our life."

Screening of cacao clones in clonal gardens



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