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MONITOR

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Seaweed Farming in Indonesia

Seaweed is a major source of income for tens of thousands of small Indonesian farmers, as well as collectors, traders, exporters, and producers. In 2004, IFC's Program for Eastern Indonesia Small and Medium Enterprise Assistance (PENSA) recognized the growing economic opportunities around the 100 million dollar Indonesian market for seaweed and that Indonesia had no effective advisory services program for seaweed farmers and launched SEAplant, which provided a spectrum of services including training on various aspects of the seaweed process including planting, harvesting and post-harvest handling; market information; established new and higher-priced sales channels, and encouraged the development of farmer cooperatives and local value-added seaweed-processing facilities. In 2005 and 2006, two different independent project evaluations were conducted. The valuable lessons learned at the early stages of the program are broadly relevant to private-sector development programs in agribusiness and beyond.

IMPACT EVALUATIONS

Two separate independent evaluations were conducted in 2005 and 2006. The first evaluation which focused on the farmer co-operative program, surveyed 225 households, collecting detailed data on participating and non-participating seaweed farmers and their farming methods to assess the uptake and impact of the training component of the program. As part of the externally conducted survey, IFC verified whether or not individuals were following PENSA's advice through in–depth qualitative surveys of farmers, collectors, processors, and exporters combined with a randomized scientific trial (treatment vs. control seaweed plantings). The second evaluation, which was part of a broader PENSA-wide review was an ex-post evaluation investigating impacts across all SEAplant's myriad program components.

Both evaluations found little evidence of success with respect to the project's objectives of improving farmers' knowledge, practices, and incomes. In general, there was little difference in the results for participating and non-participating farmers. While some farmers adopted new approaches to seaweed farming as a result of the program, and others found that the field trials conducted with the help of PENSA were useful, these results were not widespread.

Seaweed	Treatment	Control
Pod size (best: 62 g)	34g	39g
Best drying practice	61%	63%

There is also no evidence that improved market information or the advice to growing bigger plants to improve quality, have enabled farmers to obtain higher prices. The results indicate that the price paid to participating and non-participating farmers was roughly the same, with one exception. PENSA has helped four farmer groups in South Sulawesi obtain a higher price for their seaweed by selling it directly to an exporter, effectively cutting out collectors. So far, these farmers have sold 40 tons of seaweed worth roughly $20,000 USD, earning an additional IDR $0.08/kg ($0.05 net of handling and transportation costs). The higher price translates into an additional $2,100, $23 per farmer net of transport costs. If this price differential remains constant and 200 tons are sold as agreed vis-à-vis the exporter, each farmer would earn an additional $11,500 over the term of the agreement. To earn this extra income, farmers must assume the duties of collectors—collect, clean, sort, store, and transport their seaweed to the exporter. This is only cost effective if farmers have sufficient volume (6-8 tons) to fill a small truck.

This initial work with farmers is just one piece of the broader IFC program. Outside of farmer support

Monitor shares key findings from in-depth reviews of IFC programs and projects conducted by external evaluators. The reviews address the relevance, efficiency, effectiveness and sustainability of these programs. For more information about the evaluation of IFC programs visit http://www.ifc.org/results.

the program is also working on local processing as 80% of seaweed is waste, and market linkage opportunities. It is hoped that this work should demonstrate much greater development impact than the farmer assistance program that is being phased out.

SEAplant's cost has been high relative to benefits derived to-date. IFC committed roughly US$1.9 million to the SeaPlant program through 30 June 2006, and this investment has not yet yielded significant tangible returns in terms of either increased earnings for farmers or the introduction of value-added processing. While results are still forthcoming, IFC may be able to build on the strong relationships established with farmer groups, exporters, processors, and downstream customers as well as the knowledge of the sector gained over the past few years. SEAplant has clearly identified major issues affecting the sector and helped put seaweed back on the radar of the Indonesian government of Indonesia and the World Bank. The World Bank is planning a 100 million dollar project that includes seaweed and builds on the lessons learned by IFC. PENSA has also provided assistance to development organizations including CARE Canada, which is developing a seaweed-based livelihood program in the country. In addition, the program has yielded valuable lessons for IFC's agri-business programs, as discussed below.

SPECIFIC LESSONS FOR AGRI-BUSINESS PROGRAM DESIGN & IMPLEMENTATION

Lesson 1. It can be costly to learn about the state of farming in a local area. Understanding farmers' training needs requires detailed knowledge of current farmer views and practices. The survey results showed that 95% of non-beneficiaries in South Sulawesi and NTT knew that seaweed growing cycles should be 40-days or more, and 82% knew that the use of a platform dries seaweed faster drying seaweed on the ground. If farmers already were aware of this information, then this component of the training was redundant.

The cost of obtaining detailed knowledge of a particular industry in a particular area is high, and this knowledge cannot be easily transplanted to other areas. Farmer knowledge of new techniques and technologies and actual farming methods vary significantly across areas and even within the same village. When the program was expanded to Bali, there was a need to gather detailed knowledge all over again since surveys showed that Bali resembled NTT more than South Sulawesi in terms of farmers' seedling sizes, but that farmers often harvested crops in Bali sooner than in NTT.

Lesson 2. There can often be a hidden logic to current behavior; the laboratory is not the field, and advice needs to be contextualized to local conditions. Techniques that excel in the laboratory do not always work best in the field. For example, PENSA's recommended seaweed seedling size was 200 grams. As the program was to be expanded from South Sulawesi to Nusa Dua, Bali, an experiment was conducted to determine the appropriateness of the advice. The trial involved planting seedlings of 80, 100, 120, 150, and 200 grams to reflect the range of weights that the majority of farmers in this area likely plant (around 80 to 150 grams) as well as to include PENSA's advice. The farmer who agreed to be part of the trial planted between 21-24 of each size of seedling with the help of a local NGO, IFC field staff, and the research staff. Every two weeks, the lines were removed from the plot. Each cutting was weighed using a food scale, recorded, re-attached, and re-planted; lost cuttings were recorded as zero. Additionally, all foreign materials (including junkweed) were removed before seaweed was weighed. The seaweed was harvested after 43 days.

Table 1 presents the results of the trial. The first three columns list the weights of the initial seedlings, the number of seedlings planted and the total initial weight of all the seedlings of that particular size. The results after 14, 28, and 43 days are shown. Growth rates were very similar over the first 14 days of the trial (Column 5). How-

Table 1: Results of the Trial in Nusa Dua, Bali

			14 days later		28 days later		43 days later			
Size (grams)	Number of Cuttings	Initial Weight	Weight	Percent change	Weight	Percent change	Weight	Percent change	No. Cuttings Remaining	Return per gram invested
80	24	1920	3345	74.20%	5380	180.20%	6210	223.40%	19	3.23
100	22	2200	3930	78.60%	5600	154.50%	4240	92.70%	16	1.93
120	24	2880	4695	63%	7345	155%	5280	83.30%	18	1.83
150	22	3300	5505	66.80%	7545	128.60%	4680	41.80%	16	1.42
200	21	4200	6615	57.50%	9055	115.60%	5605	33.50%	16	1.33

ever, by day 28, growth rates appeared to differ (Column 7). The seedlings of an initial weight of 80 grams produced the highest returns (180%), while larger seedlings produced positive, but smaller returns. At 43 days, many of the seaweed seedlings had been lost. Total seaweed output actually decreased from 28 days to 43 days for all initial seedlings weights except 80 grams (Column 8). Overall, as shown in Column 10, the 80-gram seedlings provided a return of 3.23 grams of seaweed per gram of seaweed invested, while the larger seedlings provided much smaller returns (1.93 grams for the 100-gram seedling, and 1.33 grams for the 200 gram seedling).

These results have limited implications because the trial was conducted in only one location. Perhaps in an area with weaker ocean currents, higher seedlings would produce greater outputs. However, the trial does illustrate that while, in theory, larger seedlings may have greater yield, they are also in greater danger of being swept away by ocean currents, and so a one-size-fits-all-approach to seaweed advice is clearly inappropriate. Many of the farmers interviewed reported that they had experimented with higher seedlings, but that outputs had not been higher. For example, a farmer in Kutah, Nusa Dua, had tried to changed some of his seedling sizes from 90-110 to 150 grams, but realized that his output was the same in both cases. As such, he returned to planting seedlings of 90-110 grams. Another farmer in Ped, Nusa Penida, reported how he had tried to plant 200-gram seedlings, but that large ocean currents had destroyed the crop. Perhaps most telling, a farmer in Suana, Nusa Penida, reported that he varied his initial seedling size based on the ocean currents.

Of course, these examples do not show that PENSA's standardized advice was necessarily poor. They simply illustrate that advice needs to be tailored for different areas, and even for different individuals. However, it is costly and time-consuming to determine what specific advice is needed in different areas or for different individuals.

Lesson 3. It is often difficult and costly to identify specific market failures. The classic rationale for market intervention is the existence of a market failure. The original project rationale was that farmers did not have access to information because they lived in remote areas. However, as discussed earlier, knowledge of some types of farming practices was generally high among farmers. Moreover, if the seaweed exporters were indeed demanding higher quality seaweed, why were collectors not informing farmers of methods to raise seaweed quality? Is quality difficult to recognize?

IFC mapped out prices offered by collectors for different seaweed qualities as shown in Table 2. Of the 170 collectors across South Sulawesi and Bali, 40% offer explicitly higher prices for higher quality seaweed (Columns 1 and 2), with the definition of quality varying. The average price difference offered by an individual collector is about $0.03 per kg. How these incentives for higher quality are offered varies from area to area, with 100% collectors offering price differentials in Takalar and 0 percent is Nusa Dua. Even if individual collectors do not offer different prices to farmers, prices vary even within districts. For example, the lowest price we recorded overall was $0.23. The highest price was $0.50 (Columns 5 and 6).

In Bali, PENSA and a local NGO recommended that farmers dry the seaweed using a platform or hanging method, requiring farmers to build bamboo platforms to raise seaweed off the ground to allow for faster drying and to distance seaweed from contamination by sand and other impurities on the ground, thereby increasing costs. Despite this advice, many farmers in this area dry seaweed on the ground, resulting in seaweed with slightly higher moisture content. Are the returns to these improved drying methods large enough to make them worthwhile?

Table 2: Price Differentials, by Collector and Overall

District	No. of Collectors	Percentage Offering Price Difference for Quality	Overall Lowest Price	Overall Highest Price
South Sulawesi				
Bantaeng	40	15%	$0.32	$0.41
Bulukumba	19	26%	$0.37	$0.43
Jeneponto	39	8%	$0.32	$0.44
Takalar	18	100%	$0.26	$0.41
Bali			$0.00	$0.00
Nusa Dua	5	0%	$0.50	$0.50
Nusa Lembongan	23	52%	$0.23	$0.26
Nusa Penida	26	92%	$0.38	$0.42
All Districts	170	40%	$0.23	$0.50

Collectors offer price incentives to reduce moisture content, but price differences in Bali were low; the collectors themselves re-dry the seaweed to reduce the moisture content before resale. Thus, there may perhaps be economies of scale for the collectors to have one set of drying equipment, rather than each individual farmer fully drying the seaweed on his own. As a result, even though farmers are not practicing the best farming methods, it is not obvious that it is efficient for them to do so. While it may also appear that the farmers are not physically obtaining price differentials for higher quality goods, it may be that the farmers are simply optimizing their production choice and simply choosing not to produce the highest quality product possible.

Given that the market already provides different prices for different quality goods, can farmers take advantage of the higher prices offered? The survey results suggest that 58% of farmers in Sulawesi always sell to the same collector. About 60% of farmers reported that the choice of collector was determined by prices offered, convenience, honesty, and whether or not the collector was a family member. In contrast, 24% say that no other collector buys in their area, and 13% of farmers are bonded to their collector due to loans. The overall analysis suggests that lack of knowledge on farming methods does not appear to be the main issue in seaweed farming; rather, the larger problems are insufficient access to credit and a relatively small number of buyers.

So, should all farmers be offered the same advice to produce higher quality seaweed? Differentiated product markets exist for seaweed, and therefore some farmers may be producing a lower quality product to satisfy the demands of the market for the low quality seaweed. If we exogenously moved all farmers from low quality to high quality, the price for high quality seaweed may fall. Indeed, we interviewed several seaweed exporters and processors, and found that they have different definitions on what quality is, and thus, offer different prices based on their demands. In general, the program demonstrated the difficulty of identifying what the market failure is in a specific market, and what particular type of intervention is most needed.

LESSONS FOR SEAPLANT

Going forward, the program should commit its resources to boosting farmer income by altering market relationships and/or establishing value-added businesses. It should consider the potential for working with additional farmer groups to enable them to assume responsibility for aggregation, sorting, transport, and sale to exporters. While this will not increase total income in an area, it will redistribute more income from one group (collectors) to another group (farmers). To be successful in this endeavor, financing requirements must be addressed.

LESSONS FOR AGRI-BUSINESS PROGRAMS

The evaluations clearly show that it is expensive to collect specific data on current farming practices and specific knowledge of what kinds of advice are appropriate in different locations. Farmers have specific knowledge that outside program administrators do not have, and the cost to discover this information is quite high. Moreover, the information gained is not generalizable across industries or locations, and in many cases, the advice is not generalizable from one farmer to his or her neighbor. As a result, even if the correct information is obtained, it is costly to scale up and expand these programs.

It is difficult to understand if there really is a market failure, or what the specific market failure is, unless we really understand the market for the particular good. In the absence of a clear understanding of the market failure, providing advice to change technologies, without addressing the reasons why individuals do not experiment and change technologies on their own, would result in low take-up of the advice.

What do these finding imply about the role of advisory services in development? The data does not suggest that agri business programs should be abandoned. Instead, these programs need to become more efficient and effective. For example, in this program and many others, outside program administrators pick which industries and locations advisory services should be administered to, as well as what specific advice is dispensed. Could beneficiaries be more involved in the process of deciding whether assistance is needed, and if so, what kind? Furthermore, should specific advice be dispensed, or, can programs be designed to allow farmers more opportunities to experiment and share knowledge among one another? In this second case, these opportunities could come from attacking market failures (perhaps stemming from a lack of access-to-finance) related to why farmers may not be pursuing their own experiments, such as a lack of access to credit or imperfect finance markets.

FOLLOW UP BY PENSA IN RESPONSE TO EVALUATION

In response to the findings of this evaluation, PENSA is phasing out the farmer training and has begun to focus on establishing value added programs and financing.

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