Gender and seaweed farming on Wagina Island, Choiseul Province in Solomon Islands

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Summary

A field survey on the socio-economic dimensions of seaweed farming was carried out on Wagina Island, Choiseul Province in Solomon Islands. Given the geographical and socio-economic conditions, seaweed farming on Wagina was found to be a viable, non gender-based income option, with women having equal chances to benefit from the cash revenues sourced from this aquaculture.

Results from a survey of 58 households (28% of all households), 40 of which were engaged in seaweed farming, showed that (a) the average annual cash income for seaweed farming households was about 52% higher (surplus of SI$10,400) than non seaweed farming households; (b) members, particularly men, of more than half of all households surveyed have either abandoned or reduced their finfishing and bêche-de-mer (and trochus) fishing; (c) 38% of all respondents believe that seaweed has improved social networking and social services in the community.

Seaweed farming was found to be essentially a family enterprise although men accounted for most (68% of total annual labour) of the annual labour input. Women and men contribute similar amounts of labour to most processes in seaweed production. A positive and statistically significant correlation was found between the number of women per household participating in seaweed farming and the household's revenues from this income source.

A number of issues, including women's roles as mothers and child educators, and certain environmental, financial and managerial problems, are highlighted and need to be addressed, to assess the future sustainability of seaweed farming on Wagina, and possibly in other communities in Solomon Islands.

1. Introduction

1.1 Objectives and background

The central aim of this paper was to demonstrate the gender-related effects of seaweed farming. This topic was one of numerous socio-economic and institutional elements addressed in a comprehensive evaluation of the socio-economic dimensions of seaweed farming in Solomon Islands, as part of a Food and Agricultural Organization (FAO) global review (Kronen et al. 2010). The Wagina seaweed farming community in Choiseul Province, one of the four major seaweed production areas in Solomon Islands, was selected for an in-depth field survey in November 2009 (Figure 1). Members of the survey team included senior and junior staff members from the Aquaculture Section of the Solomon Islands Ministry of Fisheries and Marine Resources (MFMR), a socio-economist fisheries consultant, village elders and a former project leader of the European Union funded Commercialisation of Seaweed Production in Solomon Islands (CoSPSI) Project. The survey was financed by FAO in cooperation with the Secretariat of the Pacific Community's (SPC) Aquaculture Section.

Further results obtained in the framework of the socio-economic survey have been used to provide background information on geographic, demographic and socioeconomic conditions on Wagina, and on the historic development of seaweed farming in Solomon Islands.

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Figure 1. Location of Wagina, and existing and future possible seaweed farming sites in Solomon Islands

1.2 Wagina's cultural and demographic features

Solomon Islands are believed to have been inhabited by Melanesian people for thousands of years. In the 1890s, the United Kingdom established a protectorate over Solomon Islands. The British administration resettled people from the overcrowded Gilbert Islands (Kiribati) to the islands of Wagina and Titiana in Western Solomons during the 1950s and 1960s. By 1980, these people and their descendants numbered around 3000.

The 2009 census indicates that the total population of Wagina may not exceed 1500 people. The island population is divided into three communities, the largest, Tengangea-Kukutin (about 600 people), followed by Arariki (about 400) and Nikumaroro (about 390). While Tengangea-Kukutin – often referred to as Kukutin – is Catholic, the people of Arariki and Nikomaroro belong to the United Church. The two communities of Tengangea-Kukutin and Arariki are adjacent to each other, while Nikumaroro is located further to the east on the island.

Based on the socio-economic survey results, using fully-structured, closed questionnaires, and including 58 households, the average household size is large, ranging from six to eight people, and today, most households in the three communities are engaged in seaweed farming (69%) (Table 1).

Table 1. Sampling details of socio-economic survey undertaken in Wagina, Solomon Islands

	Arariki	Tengangea/Kukutin	Nikumaroro	Wagina
Data (estimated) from 2009 census				
Total number of households	70	79	60	209
Data from FAO seaweed socio-economic survey November 2009				
Number of households surveyed	19	22	17	58
Number of seaweed farming households (surveyed)	14	14	12	40
Number of non-seaweed farming households (surveyed)	5	8	5	18
Average household size (surveyed)	6	8	7	7
Total population estimated	399	593	390	1382
Total population surveyed	108	164	110	382
Population and household survey sample (%)	27	28	28	28

1.3 Access to resources and income

The Gilbertese people of Wagina and a number of communities from Santa Isabel and Choisol have access to the islands of the Arnavon Marine Conservation Area (AMCA), which lies midway between the islands of Santa Isabel and Choiseul. The creation of AMCA began in 1995 with support from the Nature Conservancy (The Nature Conservancy 1998) to preserve diverse marine resources, including bêche-de-mer, other invertebrates and key species, all subject to increasing "boom and bust" cycles of harvesting since the 1980s. The islands are for instance the most important rookery in the western Pacific for the endangered Hawksbill sea turtle and home to one of the world's largest nesting populations of this species (SPC 1996). The management plan for AMCA included the provision of viable alternative marine enterprises.

Alternative income opportunities for people living on Wagina are limited. Copra production is no longer viable. Bêche-de-mer resources are considered exhausted in the close vicinity of the island, and no longer provide a reliable or promising income source. Income from fisheries is restricted to finfish and lobster tails, which are exported to Honiara. Survey respondents reported that the total catch and average size of lobsters harvested had decreased visibly over time. Respondents believed that the resource would be exhausted within the next years. While a total weekly production of 300 kg of lobster tails was still possible at the beginning of 2000, today's catch was reported to be down to about 40 to 50 kg per week. The lobster operations are linked with spear diving finfishing groups. Speardivers and other fishing groups sell their catch to the fishery centre which has been privately operated since October 2009. The centre buys about 400 to 500 cleaned or filleted finfish from local fishers for fortnightly export to Honiara using the inter-island cargo boat service.

Other local income opportunities are restricted to a few small island stores, a few people receiving salaries from government and church services, and the occasional selling of handicrafts (mats), garden produce or pigs. The survey showed that only one couple on the island gained their main income from gardening.

1.4 Seaweed farming in the Solomon Islands and on Wagina

Seaweed farming is regarded as one possible alternative source of income, which would reduce pressure on wild caught coastal resources in remote rural coastal communities with few income opportunities, but serviced at reasonable frequency and cost by inter-cargo boat services. Given the physical, environmental and socio-economic conditions necessary for seaweed farming, this activity is possible and likely to be economically viable in several areas in Solomon Islands.

Seaweed was first farmed in Solomon Islands in 1988 by the UK Overseas Development Agency (ODA) at Vona Vona Lagoon and Rarumana village in the Western Province using *Kappaphycus alvarezii* imported from Fiji (Tiroba and McHugh 2006). In 2000, Solomon Islands Aquaculture Division of the Ministry of Fisheries and Marine Resources (MFMR) collected seed stocks remaining from the 1988 growth trials in Vona Vona Lagoon, and used these to start growth trials in Rarumana.

Towards the end (2000) of the European Union funded Rural Fisheries Enterprise Project (started in 1994), which aimed to link the fisheries centres established earlier with Japanese aid in four provinces, seaweed farming was considered an option for these centres. This initiative was unsuccessful, because the location of fisheries centres was unsuitable for seaweed production. The idea was again taken up by the CoSPSI Project. Favourable physical conditions, and the existence of the fishery centre on Wagina, enabled the building of a seaweed warehouse in 2004 on the island to provide storage facilities, and to help market the seaweed. The People First Network (PFnet) broadband, e-mail system enabled communication between producers and buyers.

In 2005 about 130 seaweed farmers were working in Rarumana and the Shortland Islands (Western Province) and another 300 were working on Wagina. Seaweed farming had also expanded to Malaita Provine and Makira-Ulawa Province. About seven export licences were approved, although only one was renewed in 2006. This licence holder is now the sole current seaweed exporter in Solomon Islands.

Seaweed is a low-value product and therefore sensitive to beach prices, international market developments and production costs, notably transport costs. The relationship between costs and prices, access to alternative sources, financially more attractive sources of income (in Wagina particularly the opening and closing of the bêche-de-mer fishery), losses due to fish grazing, outbreaks of the filamenteous epiphyte *Polysophonia*, or 'ice-ice' caused by stress due to poor salinity and high water temperatures, and loss of production sites due to sedimentation effects after a tsunami, explain the sharp fluctuations in national seaweed production between 2003 and 2009. During this period, annual production and export volumes fluctuated between a minimum annual production of 40 tonnes and a maximum annual production of 400 tonnes of dried seaweed.

2. Results

2.1 Increased cash income

One major finding from the socio-economic survey in Wagina is that seaweed farming households gain on average about 52% (SI$10,400 per year) more cash income than those households that do not participate. Income from seaweed accounts on average for 42.5% of a farming household's total annual cash revenue. The life improvements such as better food, and food security, made possible by this increased income, are the most important changes for households farming seaweed, as well as a focus on seaweed farming rather than other household responsibilities, or gardening.

2.2 Impacts on coastal resource exploitation

While most respondents believe that the responsibilities and activities of their household members have not changed with seaweed farming, the reduction or abandonment of finfishing and bêche-de-mer fishing were reported by over half (53.7%) of all seaweed farming households. Reduced fisheries activities applied mostly to men rather than women (Table 2).

2.3 Social changes at community level

Respondents reported a variety of perceptions of change in community social structures and institutions as a result of seaweed farming. More than half (57%) of those interviewed generally reported no major change. Social networking, and a tight family system with expectations of mutual support were considered traditional values, and these have persisted since seaweed farming began on Wagina. However, 38% of respondents thought that seaweed had improved social networking, contributed to the formation of stronger groups of families sharing the same interest, and at times even resulted in families operating more independently. Frequently, improvement of social services in the community, including school, church and youth was quoted. Most believed that seaweed has triggered positive competition among farmers and families.

Some (17%) respondents indicated an increase in jealousy, and complained about people stealing ropes, seaweed and other materials. However, overall such negative effects associated with the production of seaweed were not considered to be major issues.

2.4 Labour requirements and gender participation

Seaweed farming is done as a family enterprise and includes women, men and children. However, men account for most of the reported annual working time, i.e. 68% compared with women (32% of total annual working time). As shown in Figure 2, on average women invest about half of the annual time needed for harvesting, replanting and maintenance, and drying compared with men, however, men are mainly responsible for packing and selling.

On average, most of the time invested by men in seaweed farming is dedicated to replanting and maintenance (36%) and harvesting (32%) (Fig. 3). Time spent drying and packaging account for 15%–16% of total annual labour. Least time is required for selling (1%).

Similarly, most of the time invested by women in seaweed farming is dedicated to replanting and maintenance (40%) and harvesting (34%) (Fig. 4). Time spent drying and selling is also similar to that of men (16% and 1% respectively) while only 10% of the total annual labour of women is spent in packaging.

The importance of gender in seaweed farming is highlighted by the positive and statistically significant relationship between the total number of women in a seaweed producing household and its annual income – the more women, the higher the income, pinpointing the important contribution of women to the annual household income in this sector (Fig. 5).

Table 2. Changes in personal activities with the introduction of seaweed farming.

	Activities have been reduced by:				Numbers of fishers concerned	
	100%	75%	50%	25%	Men	Women
Finfishing (% of households)	30	9	39	22	33	5
Bêche-de-mer and/or trochus (% of households)	30	22	26	22	41	5

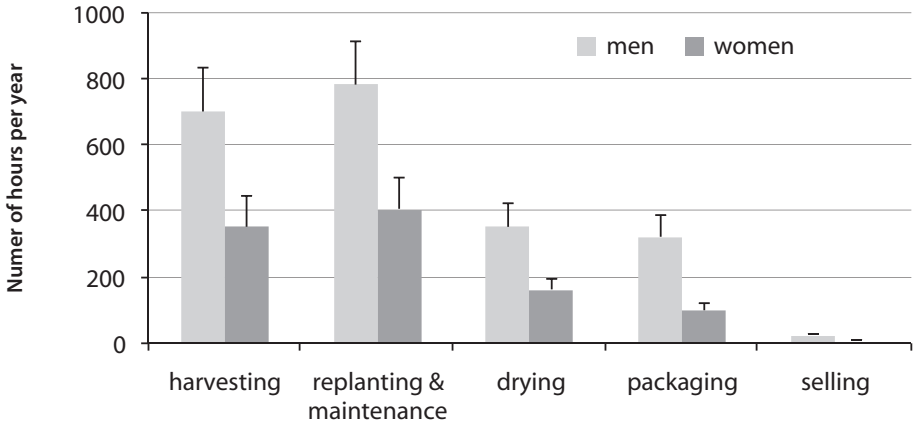

Figure 2. Total annual hours spent by gender and activity in seaweed farming

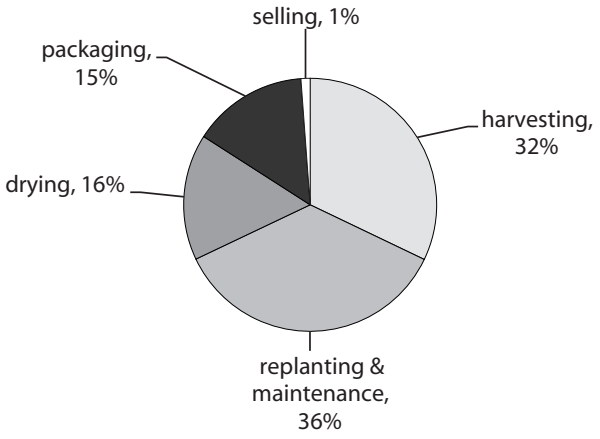

Figure 3. Men's annual work (%) input in seaweed farming activities

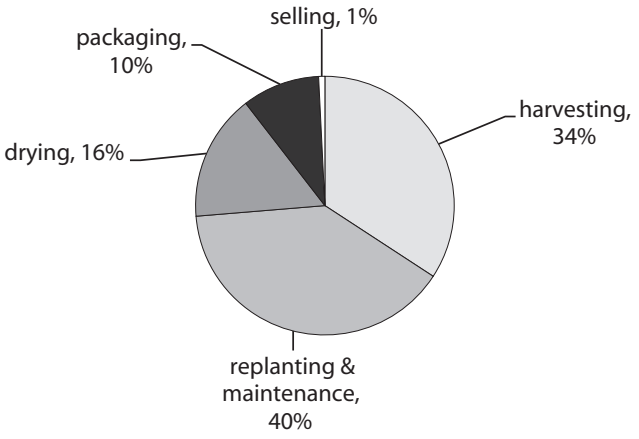

Figure 4. Women's annual work input in seaweed farming activities

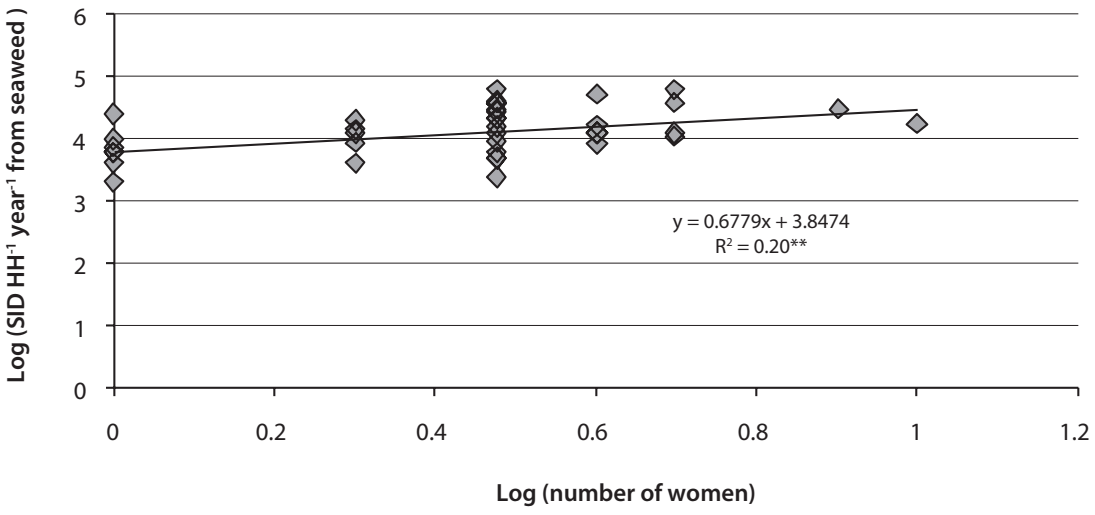

Figure 5. The relationship between total number of women per household (HH) and total annual income per household (SID/HH) from seaweed farming

2.5 Distribution and allocation of cash revenues from seaweed farming

Although comparable amounts of time are spent on selling seaweed, in most cases (45%) women, or both partners (35%) receive the cash rather than men (20%) (Figure 6).

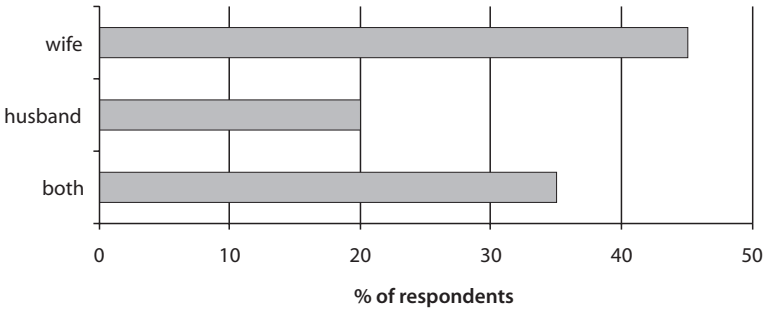

Figure 6. Recipients of cash from seaweed sale

All respondents (100%) agreed that cash revenues from seaweed farming served to cover household expenditure and living costs. However, answers on its use for covering operational and future investment costs for seaweed farming were more reluctant (92.5%), and less frequent. More than three-quarters of all households (77.5%) also use these cash revenues to cover social and church contributions, which is consistent with the general perception that seaweed has improved social services in the community.

2.6 Benefits and future potential of seaweed farming for the community as perceived by individual households

In summary, 45.5% of respondents from seaweed farming households were convinced that this acquaculture made a helpful financial contribution to livelihoods, meeting living costs, school fees and other financial obligations. Seaweed farming increased income (27.5% of respondents), to provide a better and regular cash flow than other options (10%), it was considered easy to operate (5%), providing a future for households (17.5%), and was considered an environmentally friendly activity (2.5%).

All respondents emphasised that seaweed farming helped the community to pay for the needs of daily life, increased cooperation, strengthened unity in the community and, indeed, was seen as the future for the community. Only a few respondents (5.2%), however, mentioned the participation of women in particular, in income generating activities.

2.7 Problems and solutions

Physical constraints due to bad sea and weather conditions, fish and turtle grazing, epiphytic outbreaks and lack of space for future expansion of existing or new farming sites were considered as limiting factors where little could be done. Areas subject to regular strong currents would always involve a high loss of production, as seaweed would be washed off lines. Severe fish grazing does not allow the establishment of farms in the area, while seasonal fish grazing may be acceptable within limits.

Seaweed farming is an income option for rural coastal communities with little cash flow and capital. Thus the need for motorised boat transport to reach farming sites and to transport harvests to selling points will continue to be a problem. Seaweed farmers need to reach a considerable level of production (> 3 tonnes/month) before the individual purchase and maintenance of motorised boat transport was an option. Community owned transport of this kind, which could be made available on a loan or fee system, or by agents charging for the provision of transport of harvest to selling points may be possible solutions.

Further problems voiced included unfair distribution of farming materials provided free-of-charge by the seaweed project, lack of water tanks on islands where farms are established, increased frequency of sickness among farmers, particularly pneumonia, and the stealing of ropes and seaweed. Other problems observed concerned the cutting down of local mangroves and native trees to obtain the necessary materials for pegs, poles, and drying tables.

The fact that seaweed farming was introduced in Solomon Islands within the framework of technical cooperation projects and governmental aid, furnishing materials, seedlings and training all free of charge to farmers may have contributed to the lack of financial management by farmers. Rural populations have had little need to develop financial management skills in general, however, as livelihoods are basically determined by subsistence production, and a non-monetary exchange system between community members, complemented by more or less occasional activities to earn income when needed. Training and assistance are required to acquaint seaweed farmers with the fact that seaweed farming requires a certain cash flow to cover material and operating costs, to provide for times when production is unfavourable, and to meet annual household and farming needs in relation to income earned.

Government plans call to ensure a continuous supply of high quality farming materials even at remote

sites such as Wagina, include establishing a knowledge and operational base on seaweed production material suppliers globally (MFRM 2009). The improvement of farming material may also address the substitution of local mangrove and native tree resources by imported material, or at least training and advice to improve efficiency in the use of local wood resources. Future plans should also address the safe disposal of old farming materials on isolated production sites.

In addition, a number of observations were made during the survey that need attention, to make future improvements in Wagina and possibly other seaweed farming communities. Family members involved in seaweed farming are often away from their family and community for extended periods, if they decide to have their children benefit from school education. In that case, either children are placed under the care of another family member, and separated from their parents, or the mother stays behind to care for the school children. But caring for school children then competes with the mother's participation in seaweed farming, and may reduce the family revenues. Families may also decide that children can participate in seaweed farming, which means that they leave school at an early stage, and no longer have access to secondary and perhaps tertiary education.

Gardening, a socially not highly regarded activity among Gilbertese, and culturally not an important component of the lives of people in mainly atoll environments, was easily abandoned when cash flow was improved with seaweed farming. The reported perceived benefits of substituting grown garden vegetables and fresh fish, with canned and processed food are highly questionable, financially, however. Prices paid for canned fish and pork meat at the local shops, compared with a local average price for fresh fish (average between farm-gate price paid for commercial finfishers by Kauai Tete family and at the local market on Wagina) are between 6.7 to 7.7 times higher than fresh finfish. By comparison, a pack of local cigarettes cost between SI$21 and SI$25, and smoking, as well as the chewing of bethel nut, is common among men and women.

3. Conclusions

Seaweed farming has proved a viable source of income for households on Wagina Island taking into account that alternative and competing income opportunities are limited. While farm sizes and consequently annual production vary considerably, an average annual production of > 3 tonnes is considered as a production level that may allow the investment in motorised boat transport. Experiences since 2004, when activities of the CoSPSI Project started, have demonstrated that the opening of a potentially high value fishery (bêche-de-mer) prompts the exit of seaweed farmers, particular those with small annual production capacity. But experiences have also shown that with the decline of bêche-de-mer resources, limited capacity of commercial coastal finfisheries, little if any commercial copra production potential and declining lobster resources, continuity of participation and the proportion of households engaged in seaweed farming have both increased. In fact, recent information confirms that seaweed farmers in Wagina reached their target production of 50 tonnes of dried seaweed for the first time in October 2009 (Solomon Star 2010). Given the current socio-economic conditions on Wagina, and taking into account that local commercial fishery resources have significantly declined if they have not been exhausted, the future potential for continuous and increasing seaweed production on the island is likely (Preston et al. 2009).

Results obtained from the socio-economic analysis suggest that seaweed farming is a non-gender biased activity that involves all members of the household in all production and marketing activities. The study also revealed that women have equal chances to benefit from the cash revenues from dried seaweed sales, as this income is mainly allocated and advocated by the couple heading the household, or by women rather than men. Positive correlation suggests that the more women of the household are involved in seaweed production, the higher the income.

While seaweed farming has also triggered reduction in finfishing and bêche-de-mer fisheries, mostly accounted for by men in the community, it has also helped to reduce women's gardening activities. The reduction of fishing pressure on wild-caught coastal resources is among the desired effects of aquaculture projects. However, it may be argued that a reduced supply of garden produce, and substitution of fresh crops with canned or processed food items may have negative nutritious consequences for seaweed farming households .

The fact that traditionally, women are charged with family and households chores, may explain that on average, women's total annual time input in the household's seaweed farming activities is almost 70% less than that of men. While no gender difference was found in participation in all farming activities, men account for a higher proportion of the physically demanding packing of the dried seaweed crop.

The most obvious social constraints associated with seaweed farming on Wagina arise from the role of parents, in particular mothers and formal schooling of children. The geographical distance between family homes on the island, and production sites

that require seaweed farming household members to spend extended periods away from home, limit women's participation in the farming, or separate children from their parents, or deprive children from schooling as they become engaged in seaweed farming if accompanying their parents to production sites.

Overall, long-term socio-economic stability on Wagina also requires improved financial management for seaweed producing households to ensure continuous production and cash flow, to effectively address environmental problems, in particular use of local mangrove and native timber resources, and the environmentally sound disposal of farming material waste by communities. The sound provision of high quality farming material and guaranteed inter-cargo shipping services at acceptable cost, stability of beach prices for dried seaweed crops, provision of training in improved farming techniques, and export marketing stability, are the required prerequisites on a national scale for successful seaweed production long term.

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