The Economics of Growing Organic Papaya in Fiji

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ABSTRACT

Organic agriculture is being promoted as a means to increase the incomes of Pacific island farmers. It is usually assumed that farmers' income from growing organic products will be higher because the prices they receive for these products will be higher. Yet, little or no research has been undertaken on the economics of organic agriculture in the Pacific islands. This research explores the economics of organic agriculture, with the case of Fiji papaya.

EU funded market studies have identified organic papaya as a product with considerable potential for Fijian farmers with high export prices on offer compared with conventional papaya. Significant export markets have been identified in the USA and Japan. With HTFA, Fiji has an organic quarantine treatment, which most of our competitors do not have.

One exporter has begun experimenting with an organic production system. Despite the significantly higher export prices on offer it is not known if it is financially worthwhile to produce organic papaya in Fiji, when the higher cost of inputs and expected lower yields is taken into account. To answer these questions the NWC/Fiji Papaya Project conducted a field trial to compare an organic papaya production system with a conventional system.

INTRODUCTION

In January 2010 a field trial to determine the economics of growing organic papaya in Fiji was established in the Sigatoka Valley. The package of practices developed for the organic system were based on meeting the nutritional requirements of the plant using locally available 'certifiable' inputs, lessons were also drawn from a Hawaiian model of organic papaya production. A wide range of data was collected to determine differences in yield, average fruit weight, percentage exportable, brix levels etc. Inputs for both systems were closely recorded providing accurate costs of production for both systems.

THE ORGANIC PAPAYA MARKET

EU funded papaya market studies have identified demand for organic papaya in the US and Japan. Papaya production requires substantial inputs for nutrition, disease and labour (thus it is difficult to grow organically). Many papaya producing countries are growing GMO varieties which are banned in organic certification. High price premiums and the limited competition offered by the organic market are factors that could cushion the effect of low yields and high labor costs.

MATERIALS AND METHOD

A total of 225 seedlings were planted in 150 planting spots on a trial block in the Sigatoka Valley on the island of Viti Levu in January 2010. The trial block had two treatments; best practice conventional and best practice organic, each with 75 planting spots. A spacing of 3 m between rows and 2.5 m between trees was applied and three seedlings were planted at each planting spot for later sexing. Sexing of female trees began at month 2 and was completed by month 4 and achieved around 90% hermaphrodite stand in both blocks. Data collection commenced immediately after sexing was completed. Monthly records of tree vigour were recorded through stem girth measurements. Harvesting commenced in month 9 in (September 2010). Fruit were harvested at commercial export maturity (color break) from both treatments and weighed to determine total yield per treatment. Average fruit weight was calculated through a random sampling and weighing of 30 fruit per treatment. Fruit were then graded to export standards and weighted accordingly. Brix levels were monitored through random sampling over the course of the harvesting period. Pest and disease incidence was also recorded during the trial period. Labour and non-labour expenses were carefully recorded to determine cost of production for both treatments.

RESULTS AND DISCUSSION

Yield comparisons

Organic and conventional yields are reported in Table 1 and Figure 1. Harvesting began in September 2010 and over the course of 7 months approximately 3,566 kgs were harvested from the conventional treatment and 3,361 kgs from organic treatment. Total yield from the conventional treatment is approximately 5.75% higher than the organic treatment. Data reveals that the conventional treatment yield was significantly higher than the organic treatment in the first two months of harvesting, this is likely due to the slow acting nature of the organic fertilizers applied. Both yield trends indicate a gradual increase in the first four months of harvest which then began to decline rapidly.

Percentage exportable fruits

Data on the percentage of total yield suitable for export was made available by the fact that a commercial exporter purchased the export grade fruit from the trial according to their grading standards. Table 2 and figure 2 present the data on percentage exportable fruit which is averaged monthly. Data indicates that there is little difference between the two treatments in terms of percentage exportable fruit. Both treatments averaged approximately 55% exportable fruit over the recorded period. However both treatments recorded a continual increase in the percentage of exportable fruit over the recorded period in line with the increase in average fruit weight.

Average fruit Weight

Weekly fruit weight records indicate that overall average fruit weight is higher in the organic treatment than in the conventional (>2.5%). Average fruit weight data is presented in Table 3 and Figure 3. Data indicates that the average fruit weight for both treatments increased steadily from the time of the first harvest until the month of February 2011 when it began to decline.

Brix levels

Average brix level reading from both the conventional and the organic treatments show no difference in sweetness (Table 4). Both treatments recorded exceptionally high brix averaging greater than 12%.

Costs of production

The costs of production for both treatments are presented in Tables 5-8. The costs of production for the organic treatment were lower than the conventional treatment. This fact was likely due to the low cost raw material fertilizers that were used in the organic fertilizer package (Table 8). Simple gross margin calculations reveal that both treatments resulted in a positive outcome (Tables 5 & 6), however the organic treatment had a higher gross margin. This result was surprising given the experience with organic papaya production in Hawaii. It must be noted that revenue for both treatments was calculated at the conventional pricing. It is expected that certified organic papaya will receive a modest price premium and will have a higher percentage exportable fruit as the exporter's standards will likely not be as strict on sizing.

Conclusions

Data collected from the trials shows that under Fiji conditions organically produced papaya is a profitable exercise, this profitability will likely be increased with a certified product. However, to really distinguish the viability of commercial production of organic papaya in Fiji a much larger trial should be conducted taking into account transition period, loss of farm income due to conversion period, labor costs and eventually certification. A commercial scaling up will be the next stage of this research project.

Literature cited

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Tables

Table 1: Total Yield (kgs)

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
Conventional	108.4	507.2	556.2	957.6	631.8	451.7	353.7	3566.6
Organic	65.9	241.2	621.8	984.7	586.8	447.7	413.1	3361.2

Table 2: % Exportable fruit

	Nov	Dec	Jan	Feb	Mar
Conventional	32	52	58	64	71
Organic	32	45	56	71	73

Table 3: Average fruit weight

	Nov	Dec	Jan	Feb	Mar
Conventional	415	464	536	538	466
Organic	448	464	535	552	480

Table 4: Average brix levels

Treatments	Nov	Dec	Jan	Feb	March
Organic	13	14	14	13	14
Conventional	13	14	14	12	13

Table 5: Gross margin for organic treatment

[redacted]

Table 6: Gross margin for conventional treatment

[redacted]

Table 7: Fertiliser costing for conventional treatment

Fertiliser costing for conventional trial

Month	Date of application	Fertiliser analysis	Application rate	Total cost
1	20th January	Chicken manure	8 bags per treatment	24
		Agricultural Lime	13KG/ treatment	13.9
		Tripple Superphosphate	100 grms/ tree	40.5
2	25th February	Urea	50 grms/tree	19.2
3	8th March	NPK - 13.13.21	200 grms/tree	33
		Borax	5 grms/ tree	13.5
4	25th April	NPK - 13.13.21	200 grms/tree	33
5	25th May	NPK - 13.13.21	200 grms/tree	33
6	25th June	Borax	5 grms/ tree	13.5
7	25th July	Platinum Hort - 12.4.12	200 grms/tree	54
8	25th August			
9	25th September	NPK - 13.13.21	200 grms/tree	33
10	5th October	NPK - 13.13.21	200 grms/tree	33
12	7th December	Platinum Hort - 12.4.12	200 grms/tree	54
		Borax	5 grms/ tree	13.5
14	2nd February	Platinum Hort - 12.4.12	200 grms/tree	54
	TOTAL			**465.1**
	Total fertilizer Cost per tree			**6.20**

Table 8: Fertiliser costing for organic treatment

Fertiliser costing for Organic trial

Month	Date of application	Fertiliser analysis	Application rate	Total Cost
1	20th January	Agricultural Lime	13KG/ treatment	13.9
		Fish bone meal	45kg/Block	40.5
		Power phos	22.5kg/Block	19.23
		Bio brew soil	1 Litre/Block	15
		Chicken manure	8 Bags/Block	24
		Alroc # 3	100 grms/Hole	31.5
3	29th March	Chicken manure	9kgs/Blend	1.5
		Fish bone meal	9kgs/Blend	8.1
		Bio brew growth/Foliar	400 ml/treatment	3
		C - Kelp super/ Foliar	50 ml/treatment	3
4	27th April	Chicken manure	9kgs/Blend	1.5
		Fish bone meal	9kgs/Blend	8.1
		Bio brew growth/Foliar	400 ml/treatment	4.5
		C - Kelp super/ Foliar	50 ml/treatment	0.7
5	25th May	Chicken manure	9kgs/Blend	1.5
		Fish bone meal	9kgs/Blend	8.1
		Bio brew growth/Foliar	15/Litre	1.5
		C - Kelp super/ Foliar	50 ml/treatment	0.8
6	25th June	Alroc # 3	100 grms/Hole	10.5
		Fish bone meal	9kgs/Blend	8.1
		Borax	5grms/Hole	0.18
		Bio brew growth/Foliar	400 ml/treatment	4.5
		Bio brew harvest / Foliar	200 ml/ treatment	2.3
		C - Kelp super/ Foliar	50 ml/treatment	0.7
7	25th July	Alroc # 3	100 grms/Hole	10.5
		Fish bone meal	9kgs/Blend	8.1
		Bio brew growth/Foliar	400 ml/treatment	4.5
		Bio brew harvest / Foliar	200 ml/ treatment	2.3
		C - Kelp super/ Foliar	50 ml/treatment	0.7
8	25th August	Alroc # 3	100 grms/Hole	10.5
		Fish bone meal	9kgs/Blend	8.1
		Borax	5grms/Hole	13.5
		Bio brew harvest / Foliar	200 ml/ treatment	2.3
		C - Kelp super/ Foliar	50 ml/treatment	0.7
9	25th September	Alroc # 3	100 grms/Hole	10.5
		Fish bone meal	9kgs/Blend	8.1
		Bio brew harvest / Foliar	200 ml/ treatment	2.3
		C - Kelp super/ Foliar	50 ml/treatment	0.7
10	5th October	Alroc # 3	100 grms/Hole	10.5
		Fish bone meal	9kgs/Blend	8.1
11	7th December	Alroc # 3	100 grms/Hole	10.5
		Fish bone meal	9kgs/Blend	8.1
12	2nd February	Alroc # 3	100 grms/Hole	10.5
		Fish bone meal	9kgs/Blend	8.1
	TOTAL			**351.31**
	Total cost per tree			**4.68**

Figures

Figure 1: Total Yield

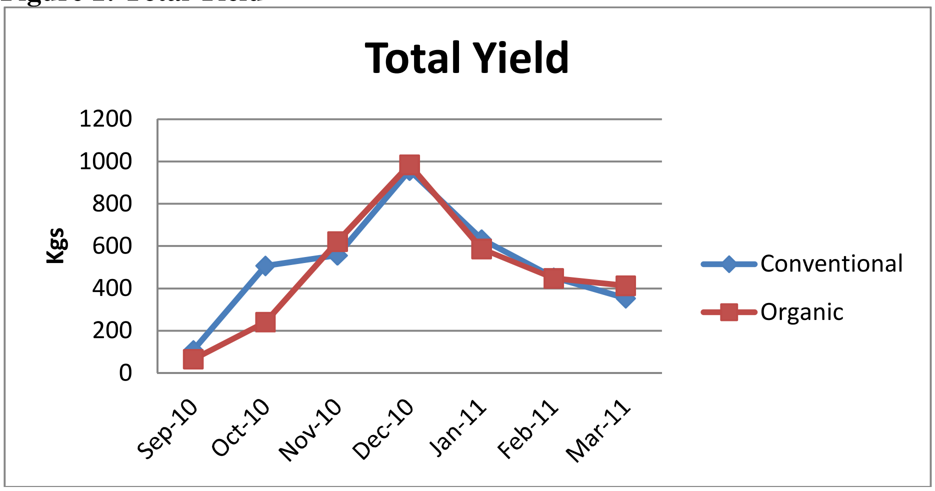

Figure 2: Percentage exportable fruit

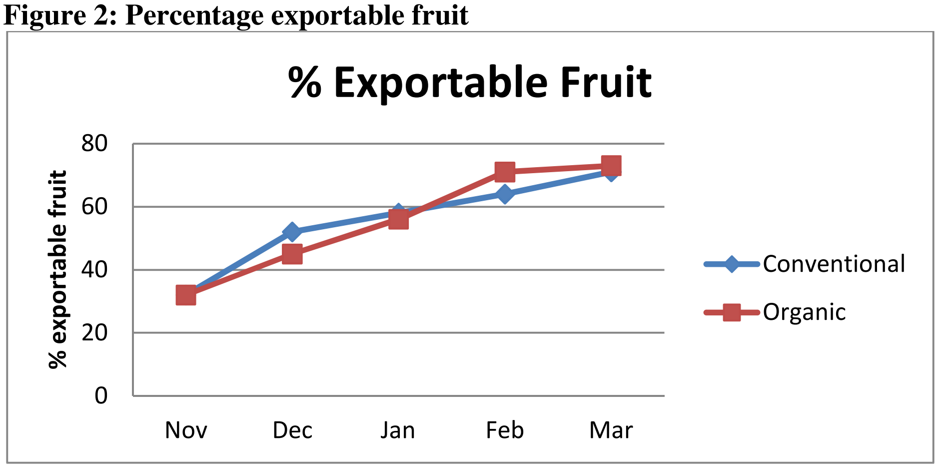

Figure 3: Average fruit weight