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**INVESTIGATION OF  
FACTORS ASSOCIATED WITH  
CROP DIVERSIFICATION  
IN IRRIGABLE LANDS  
IN  
SYSTEM B**

by

**Jane E Gleason  
W.R.B. Lalith  
P.W.A. Perera**

(Report No. 217)

**Mahaweli Economic Agency  
Mahaweli Engineering and Construction Agency**

**MARD PROJECT**



**Pimburattewa  
via Polonnaruwa**

**Development Alternatives, Inc.  
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## CONTENTS

	<u>Page</u>
INTRODUCTION . . . . .	01
METHODOLOGY . . . . .	02
RESULTS AND DISCUSSION . . . . .	03
A. Years of residence . . . . .	03
B. Education . . . . .	06
C. Farming experience . . . . .	06
D. Farmer organizations . . . . .	09
E. Extension . . . . .	11
F. Marketing . . . . .	16
G. Land suitability . . . . .	18
CONCLUSIONS . . . . .	23
REFERENCES . . . . .	25

### APPENDIX I

Investigation of factors associated with crop  
diversification in irrigable land in System B

## LIST OF TABLES & FIGURES

	<u>Page</u>
Table 1. Diversification levels of villages . . . . .	04
Table 2. Average years resident in System B . . . . .	05
Table 3. Level of education of sample settlers . . . . .	06
Table 4. Years of farming experience . . . . .	08
Table 5. FO membership & perceived importance . . . . .	10
Table 6. Percent of farmers in contact with extension workers . . . . .	12
Table 7. Nature of relationship between extensionist and farmer . . . . .	14
Table 8. Percent of farmers adopting innovations . . . . .	14
Table 9. Farmers adopting innovations on extensionists advice . . . . .	15
Table 10. Exposure of farmer to extension booklets . . . . .	15
Table 11. Percentage of selling practices . . . . .	17
Table 12. Area cultivated to OCs & paddy . . . . .	19
Table 13. Average area suitable for OC cultivation . . . . .	20
Figure 1. Area of OCs cultivated . . . . .	21

**INVESTIGATION OF FACTORS ASSOCIATED  
WITH CROP DIVERSIFICATION IN  
IRRIGABLE LANDS IN SYSTEM B**

**INTRODUCTION**

System B, the largest irrigation scheme under the Accelerated Mahaweli Programme, has a land area of 136,000 hectares, of which 12,000 are irrigated agricultural land. Most settlers come to System B with some farming experience and cultivate two paddy crops a year with the water provided by the Maduru-Oya reservoir.

Paddy cultivation, the main economic activity for farmers in System B, is not consistent with sustainable economic development. The value of one hectare of paddy production does not permit farmers to participate in the economic activities required for development of markets and other economic institutions. Over the years, paddy prices have declined in real terms as new areas in the country have been brought under cultivation, and productivity gains have been made in existing paddy lands. The island has come close to self-sufficiency in paddy production, and there are few, if any, export opportunities for Sri Lanka's relatively low grade rice.

The Mahaweli Economic Agency (MEA) and the Mahaweli Agriculture and Rural Development (MARD) Project have, in the past five years, been working to introduce crop diversification to System B as a means of raising farm incomes. Crop diversification, from paddy to cultivation of crop combinations which include vegetables, fruits, and grain legumes (hereafter referred to as "other crops" or OCs) for both the domestic and export markets, is the official strategy adopted by the Government of Sri Lanka, and is recognized as an important component of the country's economic development program.

The potential for crop diversification is high in System B. The area has fertile soils, year-round irrigation, and favourable climate for a wide range of crops. The MEA and MARD have programs in agricultural extension and research, to introduce new crops and more cost efficient production methods, farmers' organizations, to allow farmers to take advantage of economies of scale in marketing, production and credit acquisition, post-harvest technology, and marketing in both domestic and international markets. The various programs undertaken by MEA/MARD are generally designed to alleviate the constraints and risks involved with crop diversification.

Crop diversification has proven to be profitable for farmers. For example, in Yala 1992, farmers who cultivated OCs

increased net income from crop cultivation by 27 percent. This level of increased income was gained through average cultivation of 0.17 hectares of OCs.

While the gains to be made from crop diversification are known, the rate that crop diversification has occurred in System B has been slower than expected. This is especially true in areas outside of Ellewewa Block and certain villages in Dimbulagala. During Yala 1992, only slightly more than 5 percent of the total cultivated area was placed into OCs, and 35 percent of System B's farm families diversified crop production. While the level of crop diversification may be lower than expected, the number of families diversifying and the amount of land placed into OC cultivation is not evenly distributed throughout the system. Some villages have expanded production of OCs quickly, while others have lagged behind.

The MEA/MARD programs are designed to lower some of the constraints and risks involved with crop diversification. The slower than anticipated rate at which diversification has occurred and the uneven pace of crop diversification between villages implies the following: 1) MARD programs are not addressing all constraints to crop diversification; and 2) MARD programs are not implemented evenly throughout the System, with some regions within the System benefitting more than others.

This paper reports on an investigation into the factors which may constrain or enhance crop diversification in System B. This study compared various factors in high and low diversification villages to determine their importance with respect to crop diversification. The specific factors that will be discussed are: length of residence in System B, educational level of farmers, years of farming experience, farmers organizations, extension, marketing, and land suitability.

#### METHODOLOGY

A survey was carried out to investigate the factors associated with crop diversification on irrigable land in System B. Necessary data were collected with the help of pre-tested questionnaire. Seventeen units, 6 representing high diversification villages, and 11 representing low diversification villages were included in the survey.

Two factors were taken into account to determine the level of crop diversification: 1) the number of farmers who diversified crop production; and 2) the percentage area cultivated to OCs. To qualify as a high diversification village (HD village, hereafter), over thirty percent of the total number of farmers diversified crop production, and at least 4 percent of the land area was allocated to OCs. Low diversification villages

(LD villages) in general, had fewer than 20 percent of the farmers cultivating OCs and less than two percent of the land in OCs.

Table 1 shows the basic diversification status of the 17 villages. Kalukele in Ellewewa Block is the most highly diversified village with slightly more than 20 percent of the land area in OCs. Seventy-eight percent of Kalukele farmers diversified crop production. Overall 57 percent of the farmers in HD villages placed about 10 percent of the land into OCs. The average OC hectareage per farm was 0.17 hectares. Reedipokuna was the village with the lowest level of diversification. Only 4 percent of the farmers diversified cropping, and only 0.048 percent of the land was cultivated to OCs. Overall, 11 percent of the farmers in LD villages cultivated OCs on 1.2 percent of the land.

Ten farmers in each unit were randomly selected as respondents for the survey. A copy of the questionnaire is found Appendix A.

Following is a discussion of results of the survey. Individual factors and their respective impacts on diversification are presented. The results show generally that 1) there are some significant differences in certain attributes of settlers in LD and HD units which have an impact on the level of crop diversification; and 2) constraints to crop diversification have been lessened to a greater degree by the MEA/MARD programs in HD villages than in LD villages.

## RESULTS AND DISCUSSION

### A. Years of residence

In general, settlement in System B has occurred in two stages, which we will call old and new settlement schemes. In the old settlement schemes, farmers were allotted 1.2 hectares of irrigated land and 0.8 hectares of upland homestead. Old settlement scheme villages include Aralaganwila, Divuldamana, Arunapura, Dalukana, and others in close proximity to the old Pimburattewa tank.

Farmers arriving in System B under the new settlement scheme received 1.0 hectares of land and 0.2 hectares of upland from the Mahaweli Authority. Settlement under the new scheme began in Zones 1 and 5, commencing with Ellewewa and Dimbulagala Blocks and more recently has expanded into Zones 3 and 4A, with Sevanapitya, Senapura and Aselapura Blocks.

**Table 1.**  
**Diversification levels of villages in sample area**

Unit	Total cultivated area (ha)	OCs cultivated area (ha)	% OC area	Total # of Farmers	# of OCs farmers	% OC farmers	OC ha/farmers
Kalukele	282.062	57.286	20.310	282	220	78.014	0.280
Elewewa	283.000	19.666	6.949	283	144	50.883	0.137
Kandegama	134.000	19.081	14.240	134	73	54.478	0.261
Mahadamana	221.756	14.650	6.606	226	141	62.389	0.104
Bogaswewa	202.000	8.791	4.352	202	102	50.495	0.086
Mahaulpotha	168.000	7.194	4.282	168	57	33.929	0.126
<b>Overall</b>			<b>9.813</b>			<b>56.911</b>	
Aralaganwila	379.200	7.466	1.969	316	43	13.608	0.174
Galtalawa	361.200	6.315	1.748	301	45	14.950	0.140
Bimpokuna	220.000	4.417	2.008	220	61	27.727	0.072
Katuwanwila	268.000	3.977	1.484	268	26	9.701	0.153
Aluthwewa	221.000	2.778	1.257	221	31	14.027	0.090
Diuldamana	216.000	1.893	0.876	216	12	5.556	0.158
Dalukana	151.000	1.812	1.200	151	23	15.232	0.079
Sandunpitiya	121.000	0.591	0.489	121	5	4.132	0.118
Arunapura	231.000	0.311	0.135	231	4	1.732	0.078
Nelumwewa	175.000	0.141	0.080	175	4	2.286	0.035
Reedipokuna	157.000	0.076	0.048	157	6	3.822	0.013
<b>Overall</b>			<b>1.191</b>			<b>10.938</b>	

HD villages

LD villages

Average years of residence in each of the survey villages are shown in Table 2. The table shows that there is a difference between the average years of residence between LD and HD villages. Farmers in LD villages have lived in System B an average of 13 years, and in HD villages, only 9 years. However, four of the LD villages were settled during the old settlement scheme, which raises the average considerably. Excluding Divuldamana, Aralaganwila, Dalukana, and Arunapura, the average years of residence in LD villages is about 8 years, lower than HD villages, but not significantly different. Years resident in System B is not seen therefore as a factor distinguishing high and low diversification villages.

Table 2. Average years resident in System B

Village	Average years resident
Mahadamana	9.6
Mahaulpotha	7.2
Bogaswewa	7.5
Ellewewa	12.3
Kalukele	8.7
Kandegama	8.8
Average	9.0
Aluthwewa	6.4
Aralaganwila	23.9
Nelumwewa	9.0
Sandunpitya	5.0
Reedipokuna	8.9
Divuldamana	20.3
Bimpokuna	7.3
Dalukana	17.6
Galthalawa	10.8
Arunapura	19.4
Katuwanwila	6.8
Average	13.0

One noteworthy caveat to this conclusion should be mentioned, however. The villages that were part of the old settlement scheme in System B are all classified as low diversification villages. One could make the case that the farmers in these villages are tradition bound and less innovative than those who more recently arrived. However, these villages also suffer from poor drainage and flat lands, which makes diversification difficult. The fact that the farmers in these villages have large homesteads, also removes some of the need to grow OCs in the irrigated lands.

## B. Education

The vast majority of farmers (referring to male farmers) in System B have primary level of education (86 percent). Only four percent have secondary education, and ten percent of the farmers had not attended school. The average percentage of farmers who did not attend school is higher in LD villages than in HD villages, but mainly because all farmers surveyed in Katuwanwila have no formal schooling. And while the percentage of farmers who attended primary and secondary schools is higher in HD villages, the differences are not great. We must conclude that level of education does not have an impact on crop diversification.

Table 3. Level of education of sample settlers (in percent)

Village	No formal schooling	Primary education	Secondary education
Mahadamana	10	90	0
Mahaulpotha	0	100	0
Bogaswewa	0	82	18
Ellewewa	10	70	20
Kalukele	10	90	0
Kandegama	0	100	0
Average	5	89	6
Aluthwewa	0	100	0
Aralaganwila	0	100	0
Nelumwewa	10	80	10
Sandunpitya	0	100	0
Reedipokuna	0	100	0
Divuldamana	0	100	0
Bimpokuna	0	100	0
Dalukana	10	90	0
Galthalawa	10	80	10
Arunapura	11	78	11
Katuwanwila	100	0	0
Average	13	84	2

## C. Farming experience

Past experiences are often a key to future behaviour. It is only natural that farmers who have had experience with crop diversification, perhaps before settling in System B, will be more apt to cultivate OCs now. They are also more likely to

adopt new crops or techniques because of positive experiences with crop diversification in the past.

The results of the survey show that past vegetable farming experience has a significant impact on crop diversification in System B. It may be the single most important factor influencing the rate at which diversification is accomplished in the villages.

Table 4 shows the average number of years experience farming. The number of years experience of general farming experience between HD and LD villages is small, with farmers in HD villages possessing slightly more experience farming, on average, than those in LD villages. The two other factors in Table 4 are, however, significant in determining the likelihood of farmers engaging in crop diversification.

About 70 percent of the farmers in HD villages reported that their occupation before coming to System B was farming. For most villages, the percentage was closer to 90 percent, as none of the farmers in one HD village, Mahaulpotha, reported farming as a previous occupation. The situation is very different in LD villages. Only 33 of 93 farmers, or 36 percent, in the LD villages reported farming as their previous occupation. Aralaganwila has the greatest percentage reporting farming as a previous occupation, 60 percent. While many of the farmers may have had some experience farming before residing in System B as the data suggest, they report this as a secondary occupation.

Table 4 also shows another important factor. Most of the farmers in HD villages report experience with vegetable cultivation. The average number of years with vegetable farming experience is 16, nearly as much as farming in general. Only eight Mahaulpotha farmers, or 14 percent of all HD farmers, did not have experience with vegetable production.<sup>1</sup> Thus, the vast majority of farmers in the HD villages had experience with vegetable production, and for many, the number of years experience was high. Unlike the HD villages, the LD villages had very little experience cultivating vegetables. The average number of years experience is only 2.8. Thirty-seven out of 93 farmers in the LD villages have had no experience with vegetable production. A fact that has a great impact on their willingness and ability to diversify crop production.

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<sup>1</sup> It is noteworthy that Mahaulpotha, with its lack of vegetable farming experience, also has the level of diversification of all the HD villages.

Table 4. Years of farming experience and previous occupation

Village	Years of farming experience	Percent with previous occupation as farming	Years of vegetable cultivation experience
Mahadamana	25	89	25
Mahaulpotha	11	11	3
Bogaswewa	29	82	29
Ellewewa	23	100	23
Kalukele	15	80	15
Kandegama	18	80	7
Average	20.3	75	16
Aluthwewa	22	10	4
Aralaganwila	19	30	3
Nelumwewa	26	20	6
Sandunpitya	14	0	5
Reedipokuna	21	10	3
Divuldamana	20	11	4
Bimpokuna	17	40	0
Dalukana	22	30	4
Galthalawa	17	30	2
Arunapura	21	0	2
Katuwanwila	23	40	0
Average	20.1	21.5	2.8

Many farmers in Kalukele, Bogaswewa and other villages in Zones 1 and 5 come from up-country areas known for vegetable production. Many of them were evacuees, resettled to System B to give way to the Victoria and Kotmale Reservoirs. Anecdotal evidence reinforces their familiarity with vegetable production and their interest in crop diversification. For example, when working with farmers in Bogaswewa, many of whom come from Hangurukeththe, an area known for vegetable production, they often discussed the differences between up-country and low-country vegetable production with MEA/MARD extension workers. On one occasion, MEA/MARD called upon the up-country connections of Bogaswewa farmers to locate good quality red onion sets when they were impossible to find in the Polonnaruwa area. The fact that these farmers bring their skills and knowledge of vegetable production to bear in making crop production decisions, provides them with a significant advantage over those in LD villages.

Farmers in the LD units were settled to System B from the southern part of Sri Lanka. Many were landless families from

Galle, Hikaduwa, Kalutara, and other towns on the southern low coastal areas. In general, farming was not a major part of their lives before settling in System B, and vegetable production would likely not extend past the home garden. With little experience in vegetable production, these farmers are less likely to include

#### D. Farmer organizations

Farmer organizations (FOs) are voluntary organizations formed to serve the farm community in each village. Their purposes are to organize farmers to cultivate various crops, providing facilities for acquiring inputs, maintain and manage the irrigation system, and aid farmers with marketing of produce to domestic and international markets.

Crop diversification is related to farmer organizations in that many of the MEA/MARD programs are administered through village level FOs. When planning crop diversification programs, MEA/MARD looks for strong and active FOs for implementation. An example of an MEA/MARD crop diversification program was the contract extension program of Yala 1992. Administered entirely through the FOs, MEA/MARD promoted production of a variety of crops, mainly for export, but also for domestic markets. FOs, not individual farmers, contracted with outside buyers for purchase of the harvest, and with the buy-back agreement as security, the Seylan Bank in Manampitya provided the FOs, again not individual farmers, with production credit. MEA/MARD hired a cadre of extension personnel which had the sole responsibility of providing technical assistance in production and marketing of these crops.

FOs relate to crop diversification in another important way. Production and marketing of OCs, particularly perishables, is facilitated by groups of farmers cultivating as a group, either formally or informally, and with or without the help of an outside agent such as MEA/MARD. Bulk production provides farmers with production, but especially marketing economies of scale. It is much more worthwhile and efficient for a marketing agent to handle the produce of groups of farmers, rather than the small amounts produced by one or two farmers in a village. It is thus very important that farmers be willing to work together in order to bring about these advantages.

Table 5 shows total membership of sample farmers in their respective farmers organizations and their attitudes about the usefulness of the organizations. Membership of both HD and LD villages was high, about 90 percent of the total number of farmers were members. Their attitudes regarding the importance of the organizations were quite different however, and suggest

that FOs do indeed play an important role in crop diversification in System B.

About one-third of HD village farmers reported that farmers organizations are very important. All farmers in the Kalukele sample reported the FO as very important, and between 18 and 29 percent in all other HD units except Mahadamana claimed the FO to be very important. Overall, 70 percent of all farmers in HD villages thought of the FOs as very important or important, and only 44 percent classified FOs as important or very important in LD villages.

One might claim that the fact that MEA/MARD implemented crop diversification programs through FOs up-grades their importance in farmers' minds. But it is important to emphasize that one of the basic criteria for choosing FOs are their strength and dynamism. While the MEA/MARD may reenforce the strength of the FO, initially they were chosen because of attitude of their members. We can conclude that the strength and attitude of farmers organization has an impact on crop diversification.

Table 5. FO membership and perceived importance (in percent)

Village	Member ship	Very important	Important	Not important
Mahadamana	100	22.22	66.7	11.1
Mahaulpotha	100	0.00	22.2	78.8
Bogaswewa	100	18.2	72.7	9.1
Ellewewa	70	28.6	42.9	28.6
Kalukele	100	100.0		
Kandegama	80	25.0	12.5	62.5
Average	91.5	33.33	37.0	29.6
Aluthwewa	100	0.0	10.0	90.0
Aralaganwila	100	0.0	40.0	60.0
Nelumwewa	100	0.0	60.0	40.0
Sandunpitya	100	0.0	40.0	60.0
Reedipokuna	80	12.5	87.5	0.00
Divuldamana	100	0.0	33.3	66.7
Bimpokuna	90	0.0	33.3	66.7
Dalukana	60	0.0	42.8	57.1
Galthalawa	90	0.0	33.3	66.7
Arunapura	100	0.0	66.7	33.3
Katuwanwila	60	0.0	0.0	100.0
Average	88.2	1.20	42.2	56.7

## E. Extension

This is the process by which knowledge is transferred from research to farmers for improved production and increased income. In System B, two extension programs are carried out simultaneously. The first is the MEA/MARD contract extension program which is involved specifically and only with the diversification program, and the second is the traditional MEA extension program which deals with production technology of paddy and OCs. It is assumed that the more contact with extension, especially the MEA/MARD contract extension program, the greater the likelihood of crop diversification.

The MEA/MARD contract extension service is highly concentrated in HD villages (Table 6). In Kalukele, Kandegama, Mahadamana, and Bogaswewa more than 60 percent of the sample farmers had contact with MEA/MARD contract extensionists. Many of the farmers in the sample either participated in the contract extension program of Yala 1992, or they worked with MEA/MARD in production and technology trials.

The level of contract with the traditional MEA extension system was also high in the HD villages. Over 70 percent of the sample farmers had contact with an MEA field officer.

The LD villages had very little contact with the MEA/MARD contract extension program. In three villages, none of the farmers had contact, and overall only about 25 percent of the total number of farmers were in contact with MEA/MARD extension. The highest percentage of contact was in Aluthwewa with 50 percent. The LD villages, on the other hand, had very high contact with the traditional MEA extension system. Over 80 percent of the farmers reported some contact with an MEA field officer, a slightly higher percentage than that of the HD villages.

The nature of the relationship between extension worker and farmers is very important for effective transfer of knowledge. We asked farmers to rank their relationship with extension personnel as very close, close, cordial, average or poor. Table 7 shows that HD village farmers tend to have overall better relations with extension personnel than LD villages. Over 60 percent of the farmers in HD villages described their relationship with extension workers as very close or close, while only 20 percent of farmers in LD villages had very close or close relations. Over seventy-five percent of the farmers in LD villages described their relationship with extension workers as cordial or average and about 5 percent reported them to be poor.

Table 6. Percent of farmers in contact with extension workers

Village	MEA/MARD contract extensionist	MEA field officer
Mahadamana	70	80
Mahaulpotha	30	50
Bogaswewa	64	73
Ellewewa	50	70
Kalukele	100	70
Kandegama	70	72
Average	63.8	72
Aluthwewa	50	100
Aralaganwila	30	100
Nelumwewa	0	80
Sandunpitya	20	80
Reedipokuna	0	90
Divuldamana	40	90
Bimpokuna	40	70
Dalukana	30	80
Galthalawa	20	70
Arunapura	33	100
Katuwanwila	0	60
Average	24	84

The nature of the relationship is a factor in determining the extent to which farmers adopt new crops or technologies. Table 8 shows that overall, over 70 percent of the farmers in HD villages adopted innovations, while only 13 percent in LD did so. In all HD villages, farmers adopted new crops, cantaloupe, yellow onion or gherkin, or new techniques regarding production of chilli, big onion, red onion, up-country vegetables and greengram. In two LD villages, Katuwanwila and Nelumwewa, none of the farmers adopted new crops or techniques, and in the other villages, few farmers utilized new innovations.

Table 9 shows that of those who adopted innovations, 80 percent in the HD villages did so on the advice of extension workers. This means that almost 60 percent of the total number of farmers in the HD villages adopted innovations because of the influence of extension. In Kalukele and Bogaswewa, all farmers utilizing new techniques or growing new crops did so because of extension. The influence of extension in LD villages is much lower. Only 42 percent of those who adopted an innovation, or

about 5 percent of the total number of farmers, did so because of extension workers.

Exposure to new ideas in written form is also an important extension method and can be an important factor for crop diversification. Table 10 shows that a majority of farmers, almost 70 percent, in the HD villages read booklets on cultivation of new crops, new or improved techniques for cultivation of traditional OCs and nursery management. On the other hand, very few of the farmers in the LD villages were exposed to this reading material. None of the farmers in 4 out of 11 villages was exposed to extension booklets. Sandunpitya had the highest percentage of farmers with exposure to extension booklets of the LD villages. It is noteworthy that the highest percentage of the LD villages was lower than the lowest percentage of the HD villages.

The evidence strongly suggests that extension has an important influence in determining crop decision making and the level of diversification.

Table 7.  
Nature of relationship between extensionist and farmer

Unit	V.close	Close	Cordial	Average	Poor
Kalukela	60.00	40.00	0.00	0.00	0.00
Ellewewa	0.00	50.00	20.00	20.00	10.00
Kandegama	0.00	80.00	10.00	10.00	0.00
Mahadamana	11.11	77.78	0.00	0.00	11.11
Bogaswewa	0.00	54.55	45.45	0.00	0.00
Mahaulpotha	0.00	0.00	0.00	55.56	44.44
<b>Overall</b>	<b>11.86</b>	<b>50.85</b>	<b>13.56</b>	<b>13.56</b>	<b>10.17</b>
Aralaganwila	0.00	40.00	40.00	20.00	0.00
Galtalawa	0.00	10.00	40.00	50.00	0.00
Bimpokuna	0.00	0.00	60.00	40.00	0.00
Katuwanwila	0.00	0.00	40.00	60.00	0.00
Aluthwewa	0.00	30.00	70.00	0.00	0.00
Diuldamana	22.22	44.44	33.33	0.00	0.00
Dalukana	0.00	0.00	60.00	30.00	10.00
Sandunpitiya	0.00	20.00	60.00	20.00	0.00
Arunapura	0.00	22.22	55.56	22.22	0.00
Nelumwewa	0.00	0.00	60.00	20.00	20.00
Reedipokuna	0.00	0.00	40.00	40.00	20.00
<b>Overall</b>	<b>2.15</b>	<b>16.13</b>	<b>50.54</b>	<b>26.88</b>	<b>4.30</b>

HD Villages  
LD Villages

Table 8.  
Percent of farmers adopting innovations

Unit	Percentage	New crops or techniques
Kalukela	100.00	Chilli, B'onion, Cantaloupe, Gberkin
Ellewewa	60.00	Chilli, B'onion
Kandegama	90.00	Chilli, B'onion
Mahadamana	55.56	Chilli, B'onion, Cantaloupe, Bean
Bogaswewa	90.91	Chilli, B'onion, G'gram, Cabbage
Mahaulpotha	33.33	Chilli, B'onion
<b>Overall</b>	<b>72.88</b>	
Aralaganwila	20.00	Chilli, B'onion
Galtalawa	10.00	Chilli, B'onion
Bimpokuna	30.00	Chilli, B'onion, R'onion
Katuwanwila	0.00	
Aluthwewa	20.00	Chilli, B'onion
Diuldamana	11.11	Chilli, B'onion
Dalukana	10.00	B'onion
Sandunpitiya	20.00	Chilli
Arunapura	0.00	
Nelumwewa	0.00	
Reedipokuna	10.00	Chilli, B'onion
<b>Overall</b>	<b>12.90</b>	

Table 9.

Farmers adopting innovations  
on extensionists advice

Unit	Adoption (%)
Kalukele	100.00
Ellewewa	50.00
Kandegama	90.00
Mahadamana	88.89
Bogaswewa	100.00
Mahaulpotha	44.44
<b>Overall</b>	<b>79.66</b>
Aralaganwila	40.00
Galtalawa	60.00
Bimpokuna	50.00
Katuwanwila	20.00
Aluthwewa	50.00
Diuldamana	66.67
Dalukana	10.00
Sandunpitiya	20.00
Arunapura	44.44
Nelumwewa	40.00
Reedipokuna	40.00
<b>Overall</b>	<b>41.94</b>

HD Villages

LD Villages

Table 10.

Exposure of farmer to extension booklets

Unit	Percent exposed	Crops/Practices
Kalukele	100.00	B'onion,Export crops
Ellewewa	60.00	Chilli,B'onion
Kandegama	60.00	Chilli,B'onion,Cultural practices
Mahadamana	55.56	Chilli,B'onion
Bogaswewa	81.82	Chilli,B'onion
Mahaulpotha	44.44	Chilli,B'onion
<b>Overall</b>	<b>67.80</b>	
Aralaganwila	10.00	Chilli,B'Onion
Galtalawa	0.00	
Bimpokuna	30.00	Chilli,B'onion
Katuwanwila	0.00	
Aluthwewa	20.00	Chilli,B'onion
Diuldamana	11.11	Chilli,B'onion
Dalukana	20.00	Chilli,B'onion,Cultural practices
Sandunpitiya	40.00	Chilli,B'onion
Arunapura	0.00	
Nelumwewa	0.00	
Reedipokuna	10.00	Chilli,B'onion
<b>Overall</b>	<b>12.90</b>	

## F. Marketing

Marketing is a general problem in System B, because marketing outlets are not fully developed. Nevertheless, what and how many marketing options are available to farmers have an impact on their choice of crops. Those who have large numbers of marketing options or are able to make contracts with buyers are more apt to grow perishables or traditional high value crops. Those with few options, conversely, will tend to remain a producer of the main crop of the area.

The survey results show that HD villages have several marketing advantages over LD villages, and provide evidence that marketing has an impact on differing levels of crop diversifications. First, all HD villages were part of the contract extension program during Yala 1992 and had access to marketing help through the FOs or through MEA/MARD extension workers. TESS, the owners of the System B packhouse, purchased perishables from all HD villages except one, Ellewewa. In general, the HD villages had more marketing options. They were more likely to sell to wholesalers, co-operatives (Bogaswewa, for example, has a marketing co-operative located in the middle of the village), and they were more apt to grow gherkin on contract to Sunfrost.

Table 11 shows the marketing strategies employed by farmers. Overall, farmers in HD villages relied on local vendors far less than LD villages. As mentioned above they were able to sell some produce to TESS, and they sold more produce wholesalers and the cooperatives. Marketing competition is more prevalent in HD village areas, as these villages are in the southern and western (and more developed) regions of the system.

LD village farmers' reliance on local vendors, note that in four villages local vendors were the sole marketing outlet, places them at a distinct disadvantage relative to farmers in HD villages. Local vendors are unable to absorb large amounts of produce, particularly perishables. Few LD villages had the option of contracting with TESS nor Sunfrost, the gherkin exporter. With no outside agent organizing production of high value crops, especially perishables, it is not surprising that few farmers chose to cultivate OCs.

Simple geography puts LD villages at a disadvantage. Some LD villages in the sample are not attractive to marketing agents, because they border insecure regions within System B. Outside companies such as CIC and Sunfrost are unwilling to travel to certain LD villages due to lack of security. The result is that LD villages on average have few marketing options, thus less incentive to diversify cultivation.

Table 11.

## Percentage of selling Practices

Unit	Local vender	Co-op shop (CWE)	TESS	Wholesaler	Sun frost	Within farmers	MARD	VFO
Kalukale	50.00	0.00	30.00	0.00	10.00	10.00	0.00	0.00
Ellewewa	60.00	10.00	0.00	0.00	0.00	0.00	30.00	0.00
Kandegama	60.00	0.00	40.00	7.14	0.00	0.00	0.00	0.00
Mahadamana	77.78	0.00	11.11	0.00	0.00	0.00	0.00	11.11
Bogaswewa	36.36	0.00	18.18	9.09	0.00	18.18	18.18	0.00
Mahaupotha	55.56	22.22	11.11	0.00	11.11	0.00	0.00	0.00
<b>Overall</b>	<b>55.93</b>	<b>5.08</b>	<b>18.64</b>	<b>1.69</b>	<b>1.69</b>	<b>4.70</b>	<b>8.47</b>	<b>1.69</b>
Aralaganwila	70.00	0.00	30.00	0.00	0.00	0.00	0.00	0.00
Galtalawa	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bimpokuna	60.00	0.00	0.00	0.00	10.00	0.00	0.00	10.00
Katuwanwila	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aluthwewa	30.00	10.00	50.00	0.00	0.00	10.00	0.00	0.00
Diuldamana	77.78	0.00	22.22	0.00	0.00	0.00	0.00	0.00
Dalukana	60.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00
Sandunpitiya	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arunapura	77.78	22.22	0.00	0.00	0.00	0.00	0.00	0.00
Nelumwewa	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reedipokuna	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Overall</b>	<b>80.65</b>	<b>3.23</b>	<b>12.90</b>	<b>0.00</b>	<b>1.08</b>	<b>1.08</b>	<b>0.00</b>	<b>1.08</b>

HD Village
LD Village

## G. Land suitability

Matthew Cauley (1991), MEA/MARD short-term soil scientist, claimed that about 99 percent of the soil in System B is suitable for OC cultivation during Yala, provided good management techniques are applied and sufficient irrigation water is available. About 15 percent of the area are currently suitable for OCs during Maha, and an additional 77 percent are fit for OC cultivation if drainage practices such as raised beds, interception, ditching or subsurface drainage are utilized.

The level of diversification at present in System B is far from the maximum, even in what we define as high diversification villages. The overall average level of cultivation of OCs of the sample farmers in the HD villages is 0.23 hectares (this is per farmer). Seven of the 59 farmers in the HD villages did not cultivate OCs, and of those seven, three report that they possess no suitable land for OC cultivation. Thus only three out of a possible 56 farmers, 5 percent of the total, did not cultivate OCs. A high percentage of farmers diversified cropping, but the average level of diversification was far below potential.

In LD villages, 40 out of 93 farmers did not cultivate OCs, but 22 of those claimed that suitable land is not available to them. Almost 20 percent of the farmers with some suitable land did not cultivate OCs. The average hectarage of OCs per farm family was 0.13 in the LD villages, about 55 percent of the HD village average (Table 12).

Table 12. Area cultivated to OCs and paddy (hectares)

Village	Average OC area	Average Paddy area
Mahadamana	0.27	0.77
Mahaulpotha	0.25	0.72
Bogaswewa	0.24	0.76
Ellewewa	0.09	0.90
Kalukele	0.23	0.77
Kandegama	0.32	0.89
Average	0.23	0.80
Aluthwewa	0.14	0.88
Aralaganwila	0.19	0.99
Nelumwewa	0.13	0.87
Sandunpitya	0.06	0.94
Reedipokuna	0.20	0.80
Divuldamana	0.10	0.90
Bimpokuna	0.24	0.76
Dalukana	0.15	0.86
Galthalawa	0.07	1.03
Arunapura	0.05	0.96
Katuwanwila	0.05	0.95
Average	0.13	0.90

Does land that is unsuitable for OC cultivation constrain diversification in LD villages? The evidence from the sample farmers suggests that it is, at least they have the perception that many of their lands are unsuitable for crop diversification. Farmers were asked how much of their land is appropriate for cultivation of OCs. In HD villages, farmers reported that an average of 0.60 hectares of land is fit for crop diversification, below Cauley's estimate, but still a sizable percentage of land. In LD villages, the average amount reported as suitable for OC cultivation was 0.39 hectares, about two-thirds of that in HD villages.

Let us propose a new definition of diversification: the amount of land devoted to OCs as a percentage of total land suitable for OC cultivation. For example, consider farmers who have one hectare of land, of which only 0.50 hectares is suitable for OC cultivation. They cultivate 0.25 hectares to OCs. Under our new definition of the level of diversification would be 50 percent, a big increase relative to our old definition.

Table 13. Average area suitable for OC cultivation and OC cultivation as a percent of suitable land (in hectares and percent)

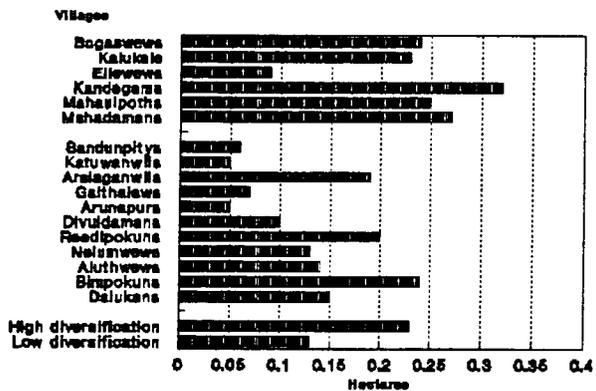
Village	Average OC area possible	Average OC area as percent of possible OC area
Mahadamana	0.53	0.58
Mahaulpotha	0.58	0.47
Bogaswewa	0.55	0.46
Ellewewa	0.52	0.25
Kalukele	0.62	0.45
Kandegama	0.74	0.51
Average	0.59	0.45
Aluthwewa	0.40	0.39
Aralaganwila	0.33	0.56
Nelumwewa	0.40	0.56
Sandunpitya	0.34	0.11
Reedipokuna	0.33	0.61
Divuldamana	0.43	0.25
Bimpokuna	0.44	0.53
Dalukana	0.44	0.44
Galthalawa	0.45	0.13
Arunapura	0.20	0.21
Katuwanwila	0.60	0.04
Average	0.39	0.38

Using the new definition, based on farmers' perceptions of OC cultivable land, the level of diversification in both the HD and LD villages is dramatically changed. The overall level of diversification in HD villages increases to 45 percent. Meaning that OCs are planted on 45 percent of the land that farmers' report as suitable for OCs. The level of diversification in HD villages doubles by using the new definition.

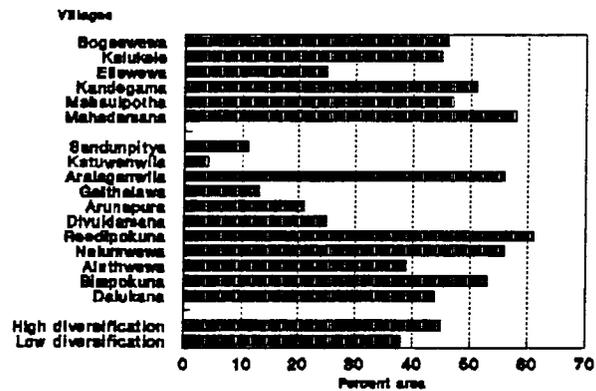
The change in LD villages is more remarkable. Using the new definition, the level of diversification based on farmers' perceptions raises diversification to 39 percent, almost equal to that of HD villages, and three times the rate using the former definition. The village with the highest diversification rate is no longer one of the HD villages, but is Divuldamana, a village generally known only for paddy production. In other words, as a percentage of land suitable for OCs, the diversification levels of the two sets of villages are comparable (Table 13).

Figure 1

Area of OCs Cultivated; 17 Villages  
Yala 1992



OC Area as Percent of Potential OC Area  
17 Villages, Yala 1992



Note Figure 1. The left side shows the average area cultivated to OCs in both HD and LD villages. The difference in the between the two sets of villages is easily discernable, with a much larger area cultivated in HD than LD villages. The right side of the figure shows the OC cultivation as a percentage of potential OC area. The differences in the two villages are much diminished, and several of the LD villages cultivate higher percentages of potential land to OCs than farmers in HD villages.

The implication of using this new definition is particularly important for monitoring of the MEA/MARD program in System B. Is it appropriate to monitor the area cultivated to OCs as a measure of the success of the diversification program? The answer to this question is yes, only if we have a good estimate of the amount of land suitable for OCs in any given village. It is possible, for example, that Borawewa village, a unit with poor drainage and flat land and in which only 2 farmers cultivated OCs during Yala 1992, has a higher diversification level than Kalukele, which had a majority of farmers cultivating OCs on 20 percent of the total cultivated land area. Kalukele has sloping land with good drainage and thus high potential for crop diversification, whereas, Borawewa has virtually no potential for crop diversification.

The MARD Project has 6000 hectare of cultivated OCs as its Yala 1995 target. This is between 50 and 60 percent of the land area in System B, and is incompatible with the perceptions of our survey farmers, who indicate that farm less land is available for OC production. If farmers are wrong and more land is suitable for OC production than they assume, the MEA/MARD program will need to institute an extension program to change their perceptions and prove to them that OCs are possible on a higher portion of their lands. If, on the other hand, farmers are correct and their suitable lands are less than the target amount, sub-surface drainage or other land alterations will be required to grow additional OCs.

To further investigate the question of land suitability, beginning in Yala 1993, the cultivation census will ask all farmers in System B to report on how much of their allotments are suitable for cultivation of OCs. It will be calculate the total possible extent of OC cultivation in irrigable lands in System B from the farmers perspective and relate that to the MARD target. In addition, it will be possible to calculate two diversification levels, the first using the old definition, and the second using the new definition. The comparison should be interesting.

## CONCLUSIONS

Crop diversification is not evenly spread throughout System B. Some areas of the System B, most notably the southern and western areas (Zones 1 and 5), have diversification levels which are much higher than other areas of the system. This report has sought to elucidate some of the factors which may account for these differences. It has specifically looked at years of residence in System B, level of education, farming experience, the influence of farmer organizations, extension, marketing and land suitability.

Years of residence in System B has little if any effect on crop diversification. Farmers settled during the new settlement scheme, from the early 1980s onward, are found in both LD and HD villages. Farmers settled in the earlier settlement scheme are primarily in the LD villages. However, years of residence does not imply that these farmers are tradition bound or unable to diversify. Other reasons account for the low levels of diversification.

Level of education also is not an important determinant for crop diversification. The educational levels of farmers in HD and LD villages show little difference. The great majority of farmers are literate and have attended primary school. About ten percent of the farmers attended secondary school.

Years of experience farming is not an important characteristic differentiating HD and LD villages. Farmers in both sets of villages had about 20 years experience. However, previous occupation is an important distinction between the two sets of villages. A majority of farmers in HD villages reported farming as their primary occupation before settling in System B, whereas, only about 20 percent of those in LD villages were previously farmers.

An extremely important factor differentiating HD and LD villages is experience with cultivation of OCs, in particular vegetables. All farmers in the HD villages, except for those in Mahaulpotha, reported experience with vegetable production before coming to System B. The average number of years experience with vegetable production was 16 in HD villages. In LD villages, less than half the farmers had experience with vegetable production, and, on average, farmers had about 3 years experience with vegetable production. The differences in vegetable production experience is related to settlers original home area.

Farmer organizations, or at least farmers' perceptions of the importance of FOs seem to be an important factor influencing diversification. Extension is also extremely important. The evidence from the survey shows that farmers in HD villages had more and closer contact with extension, especially the MEA/MARD

crop diversification contract extension program, than did the LD villages. Marketing is important in terms of the number of options available to farmers. Farmers in HD villages had more access to marketing outlets, including TESS, Sunfrost and other wholesalers, than farmers in LD villages. Fewer marketing options tends to cut down the number of profitable production opportunities, and increases marketing risk.

Farmer organizations, extension and marketing are highly interrelated factors. The MEA/MARD program in crop diversification includes elements to improve all these factors, and has been highly concentrated in HD units. By concentrating efforts in the HD units, MEA/MARD has invested wisely. The experiences of a high percentage of farmers in HD villages and the soil and drainage characteristics imply greater receptivity to the crop diversification program, than those found in LD villages. However, after three or four years of working in Kalukele, Ellewewa, Mahadamana, Bogaswewa, and other HD villages, it is time to ask if we should not shift our focus to less fortunate villages to provide them with the opportunity to gain extra income from crop diversification. However, it is important to note that the type of marketing, extension, credit and FO programs that worked in the HD villages may need to be modified to be successful in the LD villages. The lack of experience growing vegetables in HD villages and the greater percentage of unsuitable land may require alterations in the overall program. These questions should be discussed thoroughly at Project Review Committee and Workplan meetings.

It is also important to consider the sustainability of the MEA/MARD program in System B. It is time for MEA/MARD to step back from some of the more highly diversified FOs, to allow them to organize their own extension, marketing, credit and production. MEA/MARD has provided the FOs with a workable model, and now the project should slowly disengage from the HD villages so that a new type of dependency does not develop.

In addition to vegetable growing experience, extension, farmer organization, and marketing, land suitability is an important factor influencing crop diversification. HD villages have much more land available for cultivation of OCs than LD villages, and thus, much more land is placed in OCs as a percentage of total land. If the level of crop diversification is defined as the area of land cultivated to OCs as a percentage of cultivable OC land, the diversification levels of the two sets of villages converge. It shows that significant progress has been made in LD villages in spite of the certain disadvantages previously discussed. In future monitoring reports, crop diversification will be calculated as OC area as percentage of total cultivated land and OC area as a percentage of land suitable for OC cultivation.

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**INVESTIGATION OF FACTORS ASSOCIATED WITH CROP DIVERSIFICATION IN IRRIGABLE LAND IN SYSTEM B.**

Date ..... Time from ..... to ..... Enumerator .....

**A. GENERAL INFORMATION:**

- 1. Chief occupant's name .....
- 2. Address .....
- 3. Block .....
- 4. Unit .....

**B. HOUSEHOLD HEAD**

- 1. Year ..... Month..... moved to system B
- 2. Age .....
- 3. Education level (Code 1) .....
- 4. Farming experience .....
- 5. Other related experience .....
- 6. Previous occupation (Code 2) .....
- 7. Other income .....
- 8. Income from cultivation .....

Code 1:

- 1. No schooling, cannot read and write
- 2. No schooling, can read and write
- 3. Primary
- 4. Secondary
- 5. Special training
- 6. Tertiary (Degree)

Code 2:

- 1. Farming
- 2. Government service
- 3. Casual labour
- 4. Boutique/Own business
- 5. Private sector
- 6. Cottage industry
- 7. Self employment (mechanic/driver/technician/artist)

**C. ABOUT OTHER FAMILY MEMBERS**

Relationship to household head	Age	Educational level	Occupat.	Participati. of farm work	If yes how many days/season

**D. LAND AVAILABILITY AND SOIL.**

- 1.Total cultivated area (Ha) .....
- 2.OFC cultivated area
  - 1 ..... 2 .....
  - 3 ..... 4 .....
  - 5 ..... 6 .....
- 3.Paddy cultivated area (Ha) .....  
(Enumerator should do the evaluation)
- 4.How many extent are suitable for OFC .....
- 5.How many extent are suitable for paddy .....

**E. In general, do you prefer to grow paddy or OFC in your irrigated land.**

	Paddy	OFC	Both
Yala	.....	.....	.....
Maha	.....	.....	.....

**F. LABOUR PROFILE**

- 1.Do you work in your farm  
Yes - 1 No - 2
- 2.Do you have adequate family labour for your current level of crop production.  
Yes - 1 No - 2
- 3.If no give following details on additional labour used in last Yala and Maha season

Season	# of days		Total
	Paddy	OFC	
Yala	1 .....	2.....	
	3 .....	4 .....	
	5 .....	6 .....	
Maha	1.....	2 .....	
	3 .....	4 .....	
	5 .....	6 .....	

- 4.Is labour available in your area for your work?  
Yes - 1 No -2

5.How much family labour do you use in your farming

Member	Time spent in your farm as % of day time			
	25%	50%	75%	100%

**G. EXTENSION**

1.Have you seen any poster, regarding crop diversification?

Yes - 1 No - 2

If yes describe them .....

2.If yes did you understand the message well

Yes - 1 No - 2

3.Have you read any booklets on OFC?

Yes - 1 No - 2

4.If yes on what ? (Code 3 )

Code 3

1.About export oriented crop

2.Crop diversification

3.Cultural practices

4.Post harvesting

5.Market condition

6.About crop production(Eg.Chili,B'Onion)

5.Have you adopted new practices / new varieties/new crops during the last few years ?

Yes - 1 No - 2

6.If yes what are they ?

7.If no,Why? .....

8.Extension service

Officer	Heard Y/N	Met Y/N	seek assistance Y/N	Frequency of meeting (Code4)	Last met (Code5)

Code 4

1.Daily 2.Weekly 3.Monthly 4.Occasionally 5.Not at all

Code 5

- 1.At your home
- 2.His office (MARD or UM office)
- 3.Market
- 4.Village meeting place
- 5.No regarding place

8.Have you adopted new innovations because of their persuasion  
Yes - 1 No - 2

9.What is the nature of your connection with the extensionist  
1.Very close 2.Close 3.Cordial 4.average 5.Poor

10.Comparing your experiences with the advices given by the extensionist do you feel his advices are acceptable ?  
Yes - 1 No - 2

**H. FARMER ORGANIZATIONS**

1.What are the organizations connected with agricultural activities in your area and what is your involvement in these organizations?

Organization	Member	Rank according to the usefulness(Code6)	Payment for membership

Code 6

1.Very important 2. Important 3.Not important  
2.If you are not a member, why?

3.What type of service and benefits have you obtained ?

Service/ Benefits	Organization		
	1	2	3

**I. OTHER SUPPORTING SERVICES**

1. Subsidies, credit and insurance for OFC or Paddy cultivation

a. Did you obtain subsidies and / credit for OFC or Paddy cultivation ?

Yes - 1      No - 2

b. If yes, give the following information

	Amount	Purpose	Source (Code7)	Rate of interest for year
Short term				
Long term				

Code 7

- 1. Seylan bank
- 2. Government bank
- 3. Private money lender
- 4. Sunfrost
- 5. Other

c. Did you repay the above loans?

Yes - 1      No - 2

d. What are the problems that you were faced in obtaining subsidies and/or credits?

- 1. Delay in the procedure to be followed in obtaining loans
- 2. Inability to get credit as and when required
- 3. Bribery and corruption

2. Input availability

Please indicate your evaluation and source regarding the following input availability in your area

Input (OFC)	Source	Evaluation (Code 8)
<ul style="list-style-type: none"> <li>a. Fertilizer</li> <li>b. Agrochemicals</li> <li>c. Seed and planting mati.</li> <li>d. Hired labour</li> <li>e. Machinery</li> </ul>		

Code 8

1. Available in adequate amount at any time
2. Available but not in adequate amounts during the seasons
3. Seasonally unavailable
4. Unavailable

**J. DECISION MAKING**

1. What are the important factors for crop decision making.

.....  
.....  
.....

2. What were the possibilities you thought of?

.....  
.....  
.....  
.....

3. With whom did you discuss the matters? .....

4. Whose opinion influenced your ideas? .....

Give the reasons .....

.....  
.....

**K. MARKETING OF OFC PRODUCTS.**

1. To whom do you sell your produce?

Crop	To Whom	Reasons	Amount	Unite Price
1.....	.....	.....	.....	.....
2.....	.....	.....	.....	.....
3.....	.....	.....	.....	.....
4.....	.....	.....	.....	.....
5.....	.....	.....	.....	.....

2. What are the problems you are faced with in OFC trade?

Purchasing(input)

Sales(Out put)

- i.....
- ii.....
- iii.....
- iv.....

- i.....
- ii.....
- iii.....
- iv.....

3. How do you think these problems can be overcome?

Purchasing(input)

Sales(Out put)

- i.....
- ii.....
- iii.....
- iv.....

- i.....
- ii.....
- iii.....
- iv.....

**\*L. What are the main reasons prevention production of OFC?**

- 1. High risk
- 2. Has to work harder than paddy
- 3. No food security
- 4. Has to cultivate land away from home
- 5. Perishability and limited storability
- 6. Market is not reliable
- 7. Not suitable transport facilities
- 8. Insufficient capital
- 9. Labour shortage
- 10. Not input available
- 11. Lack of quality input
- 12. Lack of knowledge
- 13. Not suitable soil and drainage facilities
- 14. Not suitable weather condition
- 15. Not available water
- 16. Terrorist problem
- 17. Pest and diseases problems