RATIONAL PEASANT : THE ADAPTATION OF NEW TECHNOLOGY BY SMALL FARMERS IN TWO VILLAGES IN THE DRY ZONE OF SRI LANKA

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Introduction

The production strategies of rural farmers are based on the resource availability and their ability to make use of or manipulate such resources. The rational use of such resources depends on the opportunities available to them and their capability to make use of such opportunities. The peasants are aware of the need to improve their production strategies, not because of the national goals, but to meet the immediate needs of their families. They are also keen to raise the standard of living and provide better education to their children and better employment prospects. As Samual Popkin pointed out "Peasants are continuously striving not merely to protect but to raise their subsistence levels through long and short-term investments." Furthermore, when their position is secure against the losses, they are willing to gamble on innovations (1979:4, 19–21).

The supply of the material means of livelihood is assured through human interaction with nature but different ecological settings m lead to variation in human interaction with nature. Rural farmers to a large extent have to adapt themselves to the natural ecosystems in which they live. In exploiting the existing resources in the environment, they have to take certain risky, uncertain, complex economic and social decisions. However, such decisions are often influenced by the constraints and limitations in their environments.

Peasants or small farmers throughout the world have proved their capabilities in utilizing the available resources such as land and labour meaningfully in response to new opportunities offered to them. A small farmer is required to manipulate locally and externally supplied resources in order to develop a production strategy which permits him to make a living for himself and his family. He must experiment with the available procedures, and devise his own strategies that are suitable for his particular micro-environment. Furthermore, he is constantly making adaptations when he takes decisions regarding farm production. Adaptation is the process of coping with resources in order to realize one's goals. Thus adaptive or coping behaviour implies the making of decisions or choosing between alternatives. In environments with marginal resources, alternatives are few and it is difficult to take decisions. Man, for better or worse, is constantly using his environment for his own purposes, transforming nature into natural resources. Instead of a simple choice between traditional and modern behaviour, individuals are mixing their options to produce several different adaptive strategies. They make the choice which they believe will maximise that expected utility (Popkin 1979:31).

Ecological problems of agrarian life are based on the specialized character of the natural resources and their varying distribution in time and space. In areas where natural resources are marginal, agriculturists are not equally endowed. Some have enough land but little water, others have water but poor soil. New types of agricultural production and settlement patterns and social customs emerge to cope with these conditions.

Some who are involved in the study of modernization processes taking place in rural areas, tend to believe that peasants have to make choices between traditional and modern practices, between rationality and irrationality or economizing and non-economizing in the process of modernization. The modern and traditional ways of life are not mutually exclusive. They are each made up of potentially useful means of adaptation. Thus peasants may select only those techniques they feel may be useful in helping them to better adapt to their particular situation.

The main purpose of this paper is to show to what extent dry zone peasant farmers of Sri Lanka have adopted new agricultural technology and their adaptation to the environment and available opportunities. Based on data collected from two villages in the northern part of Kurunegala District, alternative production strategies adopted by these farmers will be demonstrated. As Hiran Dias pointed out, the study of adoption of new technology in paddy cultivation is so widely spread that a study of their attitudes towards and adoption of new technology would not serve any purpose in the present Sri Lankan context (Dias 1977:83). Therefore it is a useful exercise to see the adaptation of new technology by peasant farmers in Sri Lanka rather than looking at the adoption of such technology. The present study concentrates and focuses attention on the strategies of adaptation followed by farmers in two traditional villages in the dry zone. An attempt is made to analyse the agricultural practices in these two villages to demonstrate the adoption and adaptation of new technology by the small farmer.

The resource availability of the rural communities in Sri Lanka is varied not only at regional or interregional but also at the village levels. Climatic variations divide the island into two broad categories known as dry zone and wet zone. The dry zone with limited water resources has resulted in the evolution of socio-economic systems to harness the available resources in the area. There is a marked difference between the planned and government sponsored agricultural settlements with reliable irrigation facilities and the *Purana* villages are the traditional settlements in the dry zone, in terms of resource availability and agricultural practices.

Agriculture in the dry zone is controlled largely by the availability of water. Most of the *Purana* villages in the dry zone have only small rain-fed tanks which supplement irrigation water for the *Maha* paddy crop. Sometimes the Southwest monsoon also brings some rain and *Yala* cultivation of paddy is possible but is rarely that paddy could be grown during *Yala* in most *Purana* villages. Hence, as Leach points out rightly, water is the main and important resource in the dry zone because even if land is available, proper use of such land depends on the availability of irrigation facilities, (Leach 1963). Water has become a vital element in a greater degree for paddy cultivation with the introduction of the high yielding varieties of seeds and the associated package to the dry zone farmer because transplanting, timely application of fertiliser, weedicides and pesticides, which are necessary for high yields, depend on the assured supply of irrigation water. Hence the farmers' adoption of or the adaptation to the new agricultural technology depends on the resources available to them. That is why different combinations of agricultural practices and economic activities emerged in different parts of Sri Lanka to cope with different situations and conditions.

All these factors contribute towards small farmers decisions regarding the selection and the application of new agricultural technology. The use, rejection or modification of modern technology and cultural practices depends on the availability of resources in the area and capability of farmers to make use of the avalilable technology.

The two villages selected for the present study are in the dry zone area of Kurunegala District. Combination of wet paddy and swidden or *chena* cultivation are the two main economic activition of the area. One of the villages studied is Moragaswewa situated in the Maho Divisional Secretary's Division about 9 miles from the Maho Railway junction. It has a small tank which provided part irrigation facility for some paddy lands in the village. During *Maha* rain-fed paddy cultivation is attempted by some farmers. Moragaswewa is a typical village in the area with only one annual crop of paddy during *Maha*. During *Yala* cultivation of paddy is extremely risky and therefore only rarely that paddy is attempted.

Heelogama, the other village studied is somewhat a typical of the area. It has an assured supply of water for both *Yala* and *Maha* paddy cultivation. This makes farmers cultivate two successful paddy crops a year. This difference of resource availability in the two villages, one with an assured supply of irrigarion facilities and the other lacking such facilities, has influenced the agricultural activities and technology adapted in them.

Chena and Paddy Combination

The most important adaptation of the dry zone farmer of the *Purana* village to local ecological and climatological conditions is the cropping pattern in the area. Since paddy cultivation is limited due to unreliable irrigation facilities farmers have experimented with other types of production strategies. Combination of paddy and *chena* or swidden agriculture has been a common practice in the dry zone since immemorial times and this practice has come down to the present day in spite of government policies that discourage *chena* cultivation. The functional contribution of *chena* cultivation to the subsistence economy of the peasant farmers in the absence of alternative production strategies is considerable. This is shown in our data from the two villages studied; 82.4% of households in Moragaswewa and 53% in Heelogama operated between one to three acres of *chena* land (Sirisena, 1993). Since paddy is the major crop in Heelogama during *Yala* as well as *Maha*, there is less attention paid to *chena* cultivation in that village. *However,* combination of *chena* and paddy is the usual cropping pattern in Heelogama during both *Yala* and *Maha*. The *chena* is the only cultivation during *Yala* at Moragaswewa with no paddy cultivation due to lack of reliable irrigation facilities. But during *maha* season equal weightage is given to paddy and *chena* in that village. The cropping pattern in *chenas* shows how *chena* farmeres responded to to the challenging market demands by adopting such crops as chillies, cowpea and blackgram replacing traditional ones such as *Kurakkan*, (finger millets) vegetables and root crops which were grown for home consumption. The purpose of their adaptive strategy is to make paddy and *chena* cultivation complementary rather than competing

for available resources. This study reveals that male and female labour was carefully engaged in paddy and *chena* alternatively without any competition for labour demand for each activity. Studies done in Hambantota and Anuradhapura Districts also illustrate this complementary nature of the two agricultural activities in the dry zone (Silva, 1977, Tennakoon, 1986 and ARTI, 1980). *Chena*-Paddy combination is agro-ecologically well adapted to the dry zone in a situation where farmers have to maximise on the available resources. It is a rational decision to engage in both paddy and *chena* cultivation provided there are land resources available for *chenas*. By this combination they have evolved a production regime suitable to their micro-environment and a secure economy.

Paddy Cultivation and the New Technology

The options adopted by dry zone farmers regarding new agricultural technology associated with wet paddy cultivation demonstrate their capabilities of meaningful utilization of resources in response to new opportunities offered to them. Traditional paddy production technology has been passed on from generation to generation with utmost care, because their livelihood depended on the successful management of paddy farming. Nevertheless, these farmers were not permanently wedded to the traditional methods because, when they were offered new technology, they willingly accepted those aspects which were suitable to their resource has base and environment.

The adoption of high yielding varieties of paddy (HYV) is a good example because within a short period after its introduction the Sri Lanka farmers in both wet and dry zones accepted in willingly (Hameed, 1977, ARTI, 1975). There were two stages of adoption of HYV of paddy. The first hybrid varieties such as H4 and H7 were introduced in the mid 1950s and by 1970 within a short period of 15 years, 70% of the total paddy acreage was under these new varieties (Wickramasekara 1980). The second stage began between the years 1968-70 period with the introduction of improved varieties of new HYV such as BG 11–11, and LD 66. This second stage of adoption shows how the farmers used their experience in selecting the type of paddy most suitable for their environment. In areas with limited irrigation facilities, farmers continued to cultivate old HYV such as H4 and H7 because their experience showed that the response of such varieties to the local conditions is better than the new HYV which needed more inputs and reliable irrigation facilities for optimum results.

The present study shows that farmers have made suitable adaptations taking their resources into consideration. The farmers of Moragaswewa who have to depend *on rainfed tank for paddy cultivation were conservative in the cultivation of new varieties* because nearly 40% of the farmers used old HYV such as H4. Their experience in cultivating different varieties of paddy under rainfed or limited irrigation facilities made them decide that old HYV are better suited to their environment.

Table 1: Type of Seed Paddy Used During Maha 1978/79

	Variety of seed	No. of farmers adopted	Percentage
Moragaswewa	H4 (Old HYV)	15	39
	365 (Old HYV)	11	29
	BG 34/6 (New-HYV)	17	45
	BG 34/8 (New-HYV)	16	42
	MI 62/335 (New-HYV)	11	29
Heelogama	BG 11/11 (New-HYV)	28	80
	BG 34/80 (New-HYV)	07	20
	94/2 (New-HYV)	09	26
	V 331 (New-HYV)	01	03
	90/2 (New-HYV)	05	14

Some farmers in Moragaswewa used both varieties in different fields to suit different field conditions. Some who had rain-fed paddy fields used only OHYV without going for NHYV because such varieties needed more water. All the farmers at Heelogama used NHYV because assured supply of irrigation facilities provided sufficient water required for NHYV.

Thus although all the paddy farmers in both villages have used HYV of seed paddy, OHYV such as H 4 was used by some to suit the field conditions. Even in some other areas in the dry zone, farmers have realized the rugedness of H4 variety which gives reasonably high yields in the dry zone even at comparatively low levels of management (Hiran Dias, 1977:575).

The dry zone farmer also knew very well the advantage of cultivating HVY paddy. Ninety two percent of the farmers at Moragaswewa and 100% at Heelogama said that they adopted HVYs because of the high yield potential of these varieties. Only 3 or 8% of the farmers at Moragaswewa said that traditional varieties of paddy were better than the HVY because of their better taste and lesser vulnerability to diseases and pests. Another advantage, according to some, is that HYVs being short term crops compared to traditional varieties, the period of irrigation needed is shorter. Thus, when they found that new varieties are to their advantage the peasant farmers adopted them without any hesitation.

Use of Tractors

Mechanical inputs into paddy cultivation in the area show tractorization of some operations of paddy cultivation was common to both villages (Table 2).

Table 2: Type of Draught Power Used in Moragaswewa and Heelogama During Maha 1978/79 for Paddy Cultivation

	Moragaswewa		Heelogama	
	No. of farmers	%	No. of farmers	%
Buffaloes	03	08	15	39
2 W Tractors	10	26	29	76
4 W Tractors	33	39	03	08

The use of tractors in agricultural work, especially in paddy farming, began much earlier than the introduction of the HYV and the associated package in Sri Lanka. This happened in the early fiftees, ten years before the diffussion of HYV and the biological inputs. In the sixteen tractors were extensively used. According to the data compiled by the Agriculture Department, in 1978, 50% of the sown paddy area was ploughed by tractors (Wickramasekara 1980). Because of fast tractorization that was taking place, the draught animals were neglected and therefore more and more farmers depended on tractors for land preparation and threshing, and transport of produce. Between 1966 and 1978 around 8300 four-wheel tractors and 9500 two-wheel tractors were imported (Wickramasekara, 1980, 203).

The data from our study villages show that only 3 farmers from Moragaswewa have used buffaloes only for land preparation. Some farmers have combined tractors and buffaloes for land preparation while others have used both 4 wheel and 2 wheel tractors. Our study shows that availability of tractors in the village infiuences the type of draught power used by the farmers. At Moragaswewa there were 3 four-wheel tractors. At Heelogama there were 10 two-wheel tractors and therefore more two-wheel tractors were used for land preparation in that village. Comparison of draught power use in two villages shows that 39% of farmers at Heelogama were using animal draught power for land preparation compared to only 8% in the other village. When reliable irrigation facilities are available farmers puddle paddy fields before sowing or transp-planting and therefore with buffaloes that work becomes easy. At **Moragaswewa** with limited irrigation facilities, farmers used tractors extensively for *Kakulan* cultivation according to which they broadcast paddy without germinating and plough the fields with the onset of the monsoon rains. This type of cultivation is done immediately after the onset of monsoon rain without waiting until tanks are full to make the best use of rain.

Table 3: Amount of Land Cultivated with Different Methods of Land Preparation During Maha 1978/79

	Heelogama		Moragaswewa	
	Acres	%	Acres	%
Using buffaloes	34.5	24	03.5	3
Using 4 W tractors	08.5	6	111.25	81
Using 2 W tractors	98.0	70	21.83	16
	141	100	136.58	100

Table 3 shows that in both villages tractors have become the main source of draught power for land preparation in paddy cultivation. Use of draught animals is negligible in Moragaswewa with only 3% of the land area ploughed with buffaloes but 24% in Heelogama. Before tractorization of paddy farming, farmers owned few buffaloes for their farm work and with the onset of monsoon rains they were able to start their field work without waiting for tractors. The neglect of draught animals with the introduction of tractors led farmers to depend mostly on the latter power source. The timeliness of land preparation for paddy is important in the dry zone not only in rain-fed cultivation but also under small village tanks. In the absence of draught animals farmers have to depend on tractors. Secondly, buffaloe owners have increased their charges to be in par with the tractor charges when hiring buffaloes for land work. Therefore, farmers who hire farm power prefer to use tractors which is quick and easy. Furthermore, in the dry zone when the *Kakulan* cultivation is adopted four-wheel tractors are the best for dry-ploughing. This method is widely practised at Moragaswewa where rainfed paddy farming is more common.

Although farmers depended more on tractors for land preparation, some of them still believe that the animal traction is better for their field conditions. The better quality of work by animals, less damages to the ridges and easy credit arrangement with the buffaloe-owners are some of the reasons for the preference for buffaloes for land preparation.

However, nonavailability of sufficient buffaloes led to the use of tractors widely for paddy cultivation in the dry zone. That is why by 1978, 72% of paddy area in the dry zone was cultivated using tractors for land preparation (Wickramasekara 1980: 204). Although tractor charges increased due to fuel costs in the seventies farmers had no other alternative but to absorb the cost due to nonavailability of cheap source of farm power.

Transplanting

Among the improved agricultural practices related to HYV of paddy is transplanting. Transplanting is recommended because it improves yields mainly due to easy control of weeds and better management of crop. Compared to the adoption of HYV seeds, and the use of fertilizer, adoption of transplanting has been slow. For example, the transplanted extent increased from 7% in 1962 to only 20% of total sown are in are in the country in 1978. Financial and labour constraints and limited irrigation facilities are the main reasons for nontransplanting (Wickramasekara:213). With other modern agricultural practices, farmers knew the advantages of transplanting for a long time but they have been conservative in adopting it due to various reasons. For some farmers, transplanting involves additional cost, which they are not sure of recovering under high risked rain-fed farming. The Moragaswewa farmers do not usually attempt transplanting due to limited facilities, and unreliability of monsoon rain. During 1978/79 *Maha* none of the farmers at Moragaswewa attempted any transplanting even under their rain-fed small tank.

Farmers who cultivate paddy under rain-fed tanks and in rainfed paddy fields do not transplant paddy mainly due to uncertainty as well as delay in cultivation which prevents the maximum use of monsoon rains. Some farmers practice *Kakulan* cultivation to make the maximum use of monsoon rain. This helps them to conserve water in their small village tanks to supplement irritation preventing crop failures. Transplanting involves intensive lands preparation which needs more water over a longer period and hence limited water resources at Moragaswewa dissuade farmers from transplanting. To that extent farmers are selective in modern agricultural practices in our study locations.

At Heelogama 82% of farmers did transplant paddy in 1978/79 *Maha* although some of them also have used the method of broadcasting in combination with transplanting as follows (Table 4).

Table 4: Method of Planting Paddy at Heelogama During 1978/79 Maha

	No. of farmers	%
Broadcasting seeds	12	32
Row planting	03	08
Ttansplanting	31	82

All the farmers except one at Heelogama were in favour of transplanting and they saw the advantage of transplanting compared to broadcasting; 82% of farmers said that transplanting increases yields and 66% said transplanting makes weed control easy. Only one farmer thought that broadcasting reduces labour constraints during the peak demand period and reduces the cost. Although HYVs perform better under transplanting, it is not possible to transplant when there are no reliable irrigation facilities. Farmers at Moragaswewa knew that transplanting increases yields but undependable irrigation discourages them from using this method. As pointed out by Wickramasekara only 60% of the total area of paddy land in sri Lanka has potential for transplanting as defined by the level of irrigartion (Wickramasekara, 1980). Hence, unless better irrigation can be provided there is no point in advocating transplanting in areas with no reliable irrigation facilities.

Use of chemical Fertilizer

When a high yielding variety of paddy is cultivated, associated biochemical innovations such as chemical fertilizers pesticides and flow of irrigated water that are com-plementary inputs must be adopted and applied at the same time if the potential output is to be achieved. Sri Lankan farmers have been conservative in their adaptation of innovations mainly due to other constraints. When there is sufficient water for the paddy crop, farmers are liberal in using chemical fertilizers because they are sure of the returns for the investment. On the other hand, when they have no assured supply of irrigation facilities they are conservative in the adoption of new inputs and cultural practices. The application of fertilizers is very important among the improved practices needed to reap the benefits of new varieties of paddy. In the dry zone, where there are no reliable irrigation facilities, farmers apply less fertilizers specially when they cultivate paddy under small tanks and rain-fed conditions (Gunawardena *et al*, 1980:23). This is mainly due to the selective adoption by the dry zone farmer of the new agricultural practices associated with the HYV seeds and associated package (Dias 1977:73). This is because they know that in high risk areas they have to be selective in choosing the level of technology to the productivity potential of the area. The levels of fertilizer use in our two study villages demonstrate the adaptive strategies followed by small farmers in different environments.

When the two villages are compared, the fertilizer use at Heelogama, is more than in the other village. All the the farmers at Moragaswewa who used fertilizer for paddy cultivation used one cwt or less per acre which is less than the recommended amount; 26% of the farmers at Moragaswewa did not use fertilizer at all for paddy. Only 45% of the toatal paddy lands at Moragaswewa had chemical fertilizer used during *maha* 1978-79. Thus the average amount, that is 2 cwts per acre at Heelogama, is twice the amount used at Moragaswewa. This difference is mailny due to the uncertainty of water supply at Moragaswewa and the high risk involved in paddy cultivation in that village, although they knew the advantage of the use of chemical fertilizer.

Farmers of both villages agreed that HYVs of paddy respond quickly to chemical fertilizers and that the yield will increase as a result. But in the use of fertilizer Heelogama farmers were far more liberal than those of Moragaswewa.

Table 5: Advantages of Use of Chemical Fertilizers

	Moragaswewa		Heelogams	
	No. of farmers	%	No. of farmers	%
Responds quickly	28	74	38	100
Increases yield	10	26	08	21.5
Necessary for HYV	07	18	06	06
Easy to use	03	08	38	100
Not good to use chemical Fertilizer	01	03	—	—
No paddy	03	08		

The use of fertilizer further demonstrates the selectivity in the adoption of new technology by the farmers of the two villages.

Weeding

Traditionally weed control was done by having standing water in the paddy fields. A few inches of water constantly in the *Liyadda* or field control weeds but dry conditions lead to rapid weed growth.

Table 6: Methods of weed Control During Maha 1978/79

	Moragaswewa		Heelogama	
	No.	%	No.	%
Did not control weeds	16	42.11	23	60.53
Chemical weedicides	20	52.63	04	10.53
Weeding by hand	02	5.26	12	31.58
Using weeders	—	—	03	7.89

When the two villages are compared, we note that farmers at Moragaswewa had made more effort to control weeds than those at Heelogama. Sixty one percent farmers at Heelogama did not control weeds compared to forty two perscent at Moragaswewa (Table 6.)

Heelogama farmers had sufficient water for their paddy fields and therefore a continuous supply of water did have some effect on weed control. Furthermore, most of them transplanted paddy which also helped to reduce weed growth. Seed broadcasting and limited water in the paddy fields at Moragaswewa made farmers use different methods of weed control. Another difference between the two villages is that 52.63% of paddy farmers at Moragaswewa have used chemical fertilizer compared to only 10.53% at Heelogama. At Heelogama 31.58% of farmers have used manual labour for weed control compared to only 5.26% at Moragaswewa. However, in both villages most of the farmers knew that weed control led to better yields (Table 7).

Table 7: Advantages of Different Methods of Weed Control-farmer Responses

	Moragaswewa		Heelogama	
	No of farmers	%	No. of farmers	%
Chemical Weedicides				
Easy to use	34	89.47	03	07.89
Less labour required	36	94.76	01	02.43
Quick response	33	86.84	—	—
Weeding by Hand				
Control weeds better	01	02.63	34	89.47
No bad effects of chemicals	—	—	01	02.63
Use of family labour and no cost involved	—	—	01	02.63
Use of Weeders				
Improves soil condition	—	—	01	02.63
Low cost	—	—	01	02.63

Thus, although high yielding varieties of paddy and associated package have been adopted in both villages farmers have not adopted all the practices at the same level. Weeding had not gained ground in both villages which was the general pattern in the area. Of those who controlled weeds majority preferred chemical weedicides.

Water Management

Water is a scarce resource in the dry zone and a key element in the modernization of paddy cultivation. The dry zone farmers have been very conscious of the better use of this scarce resource and there were traditional customs of better water management.

The irrigation available for Heelogama farmers comes from a major irrigation scheme whereas Moragaswewa farmers have to depend on rain-fed tanks and monsoon rains.

The abundance of water in one village and scarcity in the other has influenced the attitudes of farmers towards water management. Paddy farmers at Moragaswewa who have experienced repeated failures of crops due to water shortages are in favour of tight control of water whereas farmers at Heelogama who have a continuous supply of water during the cultivation season have different attitudes towards water management and control. Moragaswewa farmers are concerned about the maximum use of the available limited water resource and in terms of frequency of water release the majority were of the opinion that release of water every seventh day was sufficient (Table 8). Average response was that the delivery of water to paddy fields every 7th day is sufficient at every stage. Somewhat opposing view was held by the farmers of the other village who had rarely experienced crop failures due to water shortage. They wanted water delivered continuously during the cultivation season. This was the general practice in that village which led to a considerable waste of water during *maha* season (Table 9).

Table 8: Frequency of Water Release for Paddy Cultivation at Moragaswewa During Maha 1978/79 – Farmer Responses

No. of farmers	%	During land preparation	Sowing/ Transplanting	Young plants	Flowering	Maturing
03	07.89	every 05 days	07	07	07	07
01	02.63	every 08 days	08	08	08	08
01	02.63	every 10 days	07	10	05	07
01	02.63	every 05 days	07	10	07	10
13	34.21	every 07 days	07	07	07	07
02	05.26	every 03 days	07	07	07	10
01	02.63	every 10 days	07	07	07	10
01	02.63	every 05 days	07	10	07	07
05	13.16	every 10 days	07	07	07	07
01	02.63	every 07 days	07	07	07	10
01	02.63	every 07 days	07	07	05	'07
01	02.63	every 05 days	07	07	07	10
01	02.63	every 03 days	07	10	07	07
01	02.63	every 10 days	07	07	10	10
01	02.63	every 03 days	07	07	15	15
02	05.26	every 03 days	07	07	07	07
01	02.63	every 07 days	07	10	10	10
01	02.63	every 07 days	10	07	07	07
38	100.					

Table 9: Frequency of Water Release for Paddy Cultivation at Heelogama During Maha 1978/79 – Farmer Responses

No. of farmers	%	During land preparation	Sowing/ Transplan -ting	Young plants	Flowering	Maturing
26	68.42	daily	daily	daily	daily	daily
02	05.26	,,	,,	every 03 days	,,	,,
01	02.63	,,	,,	every 04 days	,,	,,
04	10.54	,,	,,	every 07 days	,,	,,
01	02.63	,,	every 05 days	daily	,,	,,
01	02.63	,,	daily	every 07 days	every 07 days	every 07 days
03	03.89	no paddy land				
38	100					

Thus when the opinions espressed by farmers in both villages are compared it appears that their long experience in the area has influenced their general views regarding water use and management.

Extension Services and Adoption of New Technology

Although one of the main reasons for the success of adoption of agricultural innovations by small farmers is attributed to the extension services of the Agriculture Department, this does not apply to every farmer. Although ARTI study of 1974 shows that the greatest impact on farmers was the agricultural extension service. However, Chambers and Wickramanayaka (1977) have clearly domonstrated that in Hambantota District this was not the case. Only sixteen percent of the farmers in that area had contact with the extension service. They have shown that such other factors as availability of inputs, water and the decision making process have contributed to adoption of new agricultural practices associated with HYV. If necessary inputs are readily available, farmers are quite rational in making decisions regarding better agricultural practices. Levels of adoption is high when water is available and when collective decisions are taken. This is supported by our data. At Moragaswewa there were two KVSs (Agriculture extension officers) living at the time we did our field work and ninety five percent of the farmers said they had close contact with them. This figure represents all the farmers in the village except the two KVS. In the other village,

where there is an assured supply of water sixty nine percent of the paddy farmers did not have any contact with the extension officers. Nevertheless, the farmers at Heelogama are better adopteres of new technology than the farmers at Moragaswewa. Hence, it is not only the extension service that has contributed to the adoption of new technology but the availability of necessary inputs as well. Although all the farmers at Moragaswewa have taken necessary instuctions from the extension officers, they have been very conservative in adopting some practices.

Table 10: Farmers' Contacts with Extension Workers During 1978/79 Maha Heelogama

	No. of farmers	%
Received instructions from KVS	11	29
Did not get any instructions	24	62
No paddy cultivation	03	08
	38	100

Type of Instructions Received by Farmers from the Extension Workers During Maha 1978/79 – Heelogama

	No. of occasions	No. of farmers	%
Selection of seeds	2	2	5
Crop diseases	3	2	5
Pesticides	1	1	3
Fertilizer	2	2	6
Nursery preparation	1	1	3
Harvesting time	1	1	3

The above figures show that Heelogama farmers had very little contact with extension workers of the Department of Agriculture although the Department has made the facilities available for farmers in the area. When asked why they had not contacted the extension workers, the response of some farmers was that they had to travel some distance to meet the KVS at his office. Some said that even when they went to see him, he was not available for consultation.

The opposite was the case in the other village studied. The two KVSs who were living in Moragaswewa had close contact with the farmers. One was officer stationed in the village and the other was in charge of the adjoining area. Both being kinsmen, farmers at Moragaswewa had ready access to them whenever they needed their help. They had received instructions regarding pesticides, seeds, agricultural loans and crop diseases. Although they received necessary instructions from the extension workers the cultivation practices were adjusted according to the availability of inputs.

Conclusion

The foregoing discussion shows that peasant farmers in the dry zone of Sri Lanka are not culturally bound to traditional agricultural practices, and that they are unable or unwilling to respond to modern incentives. They are aware of the limitation of their environments and therefore adjust and modify their agricultural practices to suit the environment in which they work. The micro-level study of two villages in the dry zone shows that there is a rationale behind the agricultural practices they have adopted in paddy cultivation. Given the available factors of production, dry zone farmers allocate or withdraw these factors from their farming activities, depending on their goals, management abilities and expectations.

The cropping pattern in any region is essentially determined by experience gained over the years on a given soil type, rainfall and climate, irrigation potential and economic considerations such as labour availability, price and marketing. It is clear from our study that irrigated land attracts more attention in terms of both management and investment. As argued by schultz peasant farmers maintain the traditional patterns of of agricultural management, not due to their hidebound restraints, but because these patterns represent a rational equilibrium under existing conditions. Therefore, in promoting agricultural innovations among peasant farmers, knowledge of existing production system is necessary in order to integrate the new technology package into the existing production regime for its effectiveness.

In the dry zone Sri Lanka, reliable irrigation is a very important complementary input which contributes to the meaningful application of several other inputs. For example, desired results from the application of inorganic fertilizer cannot be achieved without providing proper irrigation facilities. The uncertain dependance upon weather leaves the farmer at the mercy of an unpredictable environment over which he has little control. The opportunity cost of an unfavourable outcome of any innovation is very high. Farmers' information about customs is derived from his long experience and is based upon his intimate knowledge of the environment. Farmer who is involved in paddy cultivation under rain-fed condititions cannot afford the risk of applying high levels of cash inputs needed to achiveve the potential benefits from the new high yielding varieties. Productivity of any given cultural practice is different for different regions and different farms. These differences must be taken into account in analyzing agricultural technology. It appears that farmers do not make dramatic shifts from traditional practices to the complete package of recommended inputs. They switch to new varieties first with modest increase in chemical inputs. Then they gradually increase their inputs with the experience gained by using such inputs.

With farming dependent on the vagaries of an uncontrolled natural environment risks are indeed great. This unpredictability of nature is one of the major elements in general ecology that yields an overriding influence on local agricultural activities. Lack of technological control over nature like irrigation makes farming a gamble. Therefore, they have learnt to be slow in their actions. Generally peasant economies are rather sensitively adapted to local ecological circumstances and therefore attempts to alter the economics without prior analysis of their modes of adoption would be disastrous.

Small farmers are rational. If they observe that a change in production is likely for increase their net income, they would make such a change with appropriate discount for weather and uncertainty. According to some, agricultural development is difficult or even impossible because traditional farmers are resistant to change and innovation. Our study of two villages in the dry zone shows that rural farmers are rational in resource allocation as far as permitted by their environment. When irrigation is assured farmers tend to use the modern technology without much hesitation and reservation. This is clearly demonstrated by the farmers of Heelogama who have adopted new technology for paddy. In the other village, farmers have been conservative regarding the use of certain inputs due to limited irrigation but they have adopted certain inputs when the risk factor is negligible. Our study shows that regional level adaptation has to be taken into consideration and more research should be attempted on those lines in order to understand the response of small farmers to modern technology. Suitability to the environment and availability of resources have to be taken into consideration when such packages are recommended. In such an attempt knowledge of adaptation by peasant farmers of new technology is important because it is the adaptation that clearly shows the variation in the use of modern technology in rural agriculture.

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