

CROP DIVERSIFICATION IN THE MAHAWELI PROJECTS

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The Mahaweli Programme

The Accelerated Mahaweli Development Program (AMDP), which is the largest development programme undertaken in Sri Lanka, is also one of the foremost development programmes in Asia. It was to provide irrigation water to 245,000 acres of newly developed lands and 185,000 acres of land were to get supplementary irrigation. 103,000 families were to be settled in the new project areas. Five dams across the Mahaweli, were to be constructed for the generation of hydro power.

MAP 1 shows the Mahaweli Development area on a map of Sri Lanka.

The settlement programme was one of the main thrusts of the AMDP, where irrigated agriculture would be the base of the high incomes envisaged for the new settlers and be the backbone of the economy that was to develop in the Mahaweli projects and their peripheries. The development of the economy of the region depended mainly on the agricultural production of the Mahaweli areas. Therefore the Mahaweli administration put in place a very intensive agricultural extension and input system.

At the time the agricultural extension system for the first Mahaweli project, System H, was designed, the domestic agricultural sector of Sri Lanka was served by a system of agricultural extension and management which was adopted during the colonial times to regulate agriculture. This system, which has been in existence for quite a while, helped only to carry on with a rice based agricultural pattern, with the decision making and control retained at the top. It was to a great extent rigid and quite often did not

take into account the changing agricultural needs of the country and the direction in which our agriculture should go in the future.

On the other hand, a different and more dynamic management style was necessary if Mahaweli agriculture was to adapt itself to changing conditions, especially markets. The new system demanded the delegation of a large amount of responsibility and decision making to those lower down in the organization who were more sensitive to the farmers' problems, needs and efforts.

Based on this thinking the Mahaweli developed a management and extension model for System H. This model was further developed with experience and applied to the other project areas. Each Mahaweli project has a Resident Project Manager who is assisted by senior officers of the different disciplines that go to make the total project activity. He has deputies for Land Administration, Water Management, Agriculture, Community Development, Marketing, Administration and Finance. The Deputy Resident Project Manager for Agriculture was in most projects also the Department of Agriculture's Assistant Director of Agriculture (Extension) for that agricultural district. He therefore had direct links with the Department of Agriculture.

The agriculture extension system of the Mahaweli Economic Agency is depicted in Figure 1. It illustrates the high level of co-ordination between the different disciplines at Project Level and at Block Level with the final co-ordinator being the Unit Manager through whom all Mahaweli services, inputs etc. are made available to the farmer. This co-

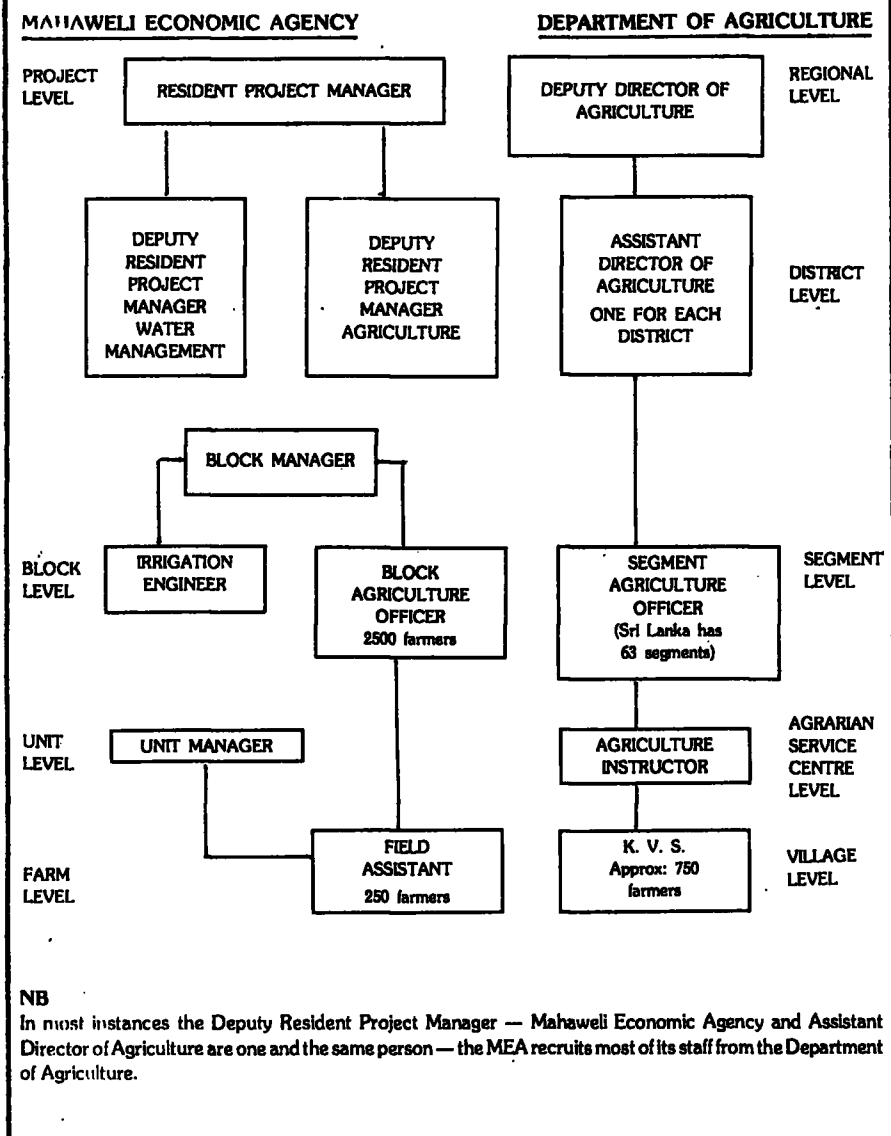
ordination is very essential and has been the catalyst that helped the integration of the different aspects of the Mahaweli Program.

Figure 1 also shows the close link between the Mahaweli Economic Agency and the Department of Agriculture. This extension system has been very effective in practice because of the capacity for quick communication from the project management down to the farmers and upwards from the farmer to the top management.

The agricultural extension program carried out under the Accelerated Mahaweli Development Program was consistent with the systematic approach adopted under the nation-wide agricultural extension and adaptive research program by the Department of Agriculture. The farmers were organized at the turnout level with two elected leaders, one for Water Management and the other for Agricultural Extension. The latter serves as the contact farmer for organizing the farmers at the turnout level to attend discussions, demonstrations etc. He also participates in the fortnightly farmer training programs conducted by the staff of the Mahaweli Economic Agency.

What the Contact Farmer learns at these fortnightly training sessions, he was supposed to communicate to his fellow farmers in the turnout group. This however did not happen as effectively as expected. However the demonstrative effect of the cultivations of the Contact Farmer using the new technologies and methods that he has learnt, compensated to some extent for the lack of direct transfer.

FIGURE 1
THE AGRICULTURE EXTENSION SYSTEM OF THE MAHAWELI ECONOMIC AGENCY
AND
IT'S LINK WITH THE DEPARTMENT OF AGRICULTURE



With more and more settlers coming in and a larger extent of land being cultivated, the problems of limited water in Yala, was gradually felt. With little rain during Yala, cultivation depends greatly on stored water augmented by Mahaweli diversions.

Since the water available for cultivation in Yala was inadequate for a full paddy extent in System H, an alternate cropping pattern had to be formulated. Mahaweli farmers had to diversify to Other Field Crops (OFCs) which consume much less water during their growing period, than rice does. This meant that a greater extent of land could be cultivated with the same amount of water, thereby benefiting a larger number of settlers.

Sri Lanka was approaching self-sufficiency in rice around the mid 1980s, which meant that the price of rice would remain stable or even drop. There was at the same time, a significant increase in the prices of the various agricultural inputs that are necessary for the cultivation of rice. This meant low profitability which was another reason that necessitated diversification.

The Guaranteed Price Scheme for paddy assures the farmer of a minimum or floor price for his produce. The open economy, however, allows the importation of rice at competitive prices. The Government also uses rice stock piles and the potential of rice imports to ensure that the price of rice remains within the reach of all consumers. The situation is aggravated further as around 15% lower yields are harvested during the Yala season compared to Maha yields. The relationship between the cost of production, differential yields and output prices is another important factor that necessitates crop diversification.

In System "H", even though there were a number of justifiable reasons for the farmers to cultivate other field crops, they continued to cultivate paddy. They were reluctant, especially soon after settlement, to cultivate other field crops in Yala. There were a number of reasons for this, among them were old values and cultural prejudices and the resultant sense of security that paddy gave; the lack of previous cultivation experience,

Need for Crop Diversification

System H was the first area to be settled under the AMDP, where each Mahaweli settler family is given 1 hectare of irrigable land for agriculture and .2 hectare of highland for their homestead. During the initial stages of settlement paddy was grown in both seasons because the settlers had a background in paddy cultivation and traditionally paddy had been cultivated in all earlier irrigation schemes. It seemed logical therefore that paddy should be cultivated in Mahaweli as well.

During the initial stages of settlement in System H there was an abundance of irrigation water and the cultivation of paddy in both seasons did not cause any problems, even though the consumption of water for a paddy crop was high, especially in Yala. The high rate of water consumption was due to evapotranspiration and high percolation rates in the reddish brown earths which constitute nearly 40% of the soils in System H. Wastage also contributed to this high rate.

The prices obtained for these crops gave the farmers a higher profit than they would have made from the cultivation of rice. Due to certain difficulties encountered by the chillie farmers in Jaffna, the quantity of chillie sent from Jaffna to the markets in Colombo and other parts of southern Sri Lanka were much less in 1980. As a result the prices paid to Mahaweli farmers for their chillies were better and acted as an incentive for them to cultivate Chillie in the next year as well. Chillie prices continued to be good and it would have been difficult, at this stage, if an effort was made, to discourage the Mahaweli farmers from cultivating chillies as it was initially to discourage them from cultivating rice.

Even though the acreage cultivated in other field crops by the farmers of System H in Yala 1980 are low, the important achievement was that those who did cultivate now are aware that OFC cultivation could be more profitable than rice. They also became confident that they could cultivate OFC in which they had hitherto very little experience.

Some of the strategies that the Mahaweli adopted in its efforts to encourage crop diversification are detailed below.

1. Education & Training

Not only were the farmers not familiar with the cultivation of other field crops but the agriculture extension staff of the Mahaweli Economic Agency too had very little experience in their cultivation. The initial task therefore was to train the extension staff especially the Field Assistants and the Block Agricultural Officers in the cultivation of OFCs. These training sessions, both long and short duration courses, were conducted by the Department of Agriculture and in some instances the MEA organised training programmes with the assistance of the DA. The cultivation of OFCs being a relatively new field — especially chillie — more research and field experience was necessary.

The Mahaweli obtains its technical support from the Department of Agriculture. The agricultural staff of the Mahaweli were trained at the in-service training centers of the Department of Agriculture. This training was mainly in

the cultivation and production of OFCs. Farmer Leaders were trained at the training centers in each Block. This training was carried out by the staff of the Mahaweli Economic Agency. Visits, for both officers and farmers, were organised to the Research Stations and Experimental Farms. Demonstrations in farmers fields on nursery techniques, farm irrigation methods, crop management etc., were also carried out. This ensured that a continuous information flow from researcher to the extension worker and from field level extension worker to the farmer, was established quickly.

2. Credit Facilities

The Mahaweli Economic Agency, through its marketing staff, arranged for the farmers to be provided credit by the two state banks — Peoples Bank and Bank of Ceylon. This was credit under a loan scheme to assist them in the cultivation of other field crops. For the first time a Crop Insurance Scheme to cover OFCs was also offered to the farmers along with the Credit Scheme for the cultivation of OFCs. The insurance scheme did not work properly and as a result was almost like a disincentive.

3. Production Inputs

At the beginning of the settlement stage, in System "H" and subsequently in the other projects as well, all seed material, fertilizer and agro-chemicals were distributed to the farmers by the Mahaweli Economic Agency. This was to ensure that there would be no breakdown in supplies at the time the farmers needed these inputs. Later on, however, with the establishment of commercial trade centers all over the Mahaweli areas, the supply of inputs was handed over to the private sector and the Co-operatives. Crop diversification meant that suppliers had to stock new types of fertilizer, and new agro-chemicals as well. With diversified cropping hardly off the ground, suppliers were not too keen on stocking agro-chemicals that they were not sure of selling. This problem necessitated the intervention of the Mahaweli Economic Agency, who purchased quantities of fertilizer and agro-chemicals and stocked them at strategic locations and made them easily available to farmers when needed. This practice, though against

the policies of the Mahaweli, was continued till the suppliers saw that crop diversification extents were increasing and decided to stock the necessary agro-chemicals themselves.

4. Marketing

The Mahaweli Economic Agency organised pre-season meetings with prospective buyers of diversified Yala crops, like the Cooperative Wholesale Establishment (CWE) for chillie, the CARE organization for Soybean, the Oils & Fats Corporation for maize for animal feed and the Paddy Marketing Board (PMB) for rice and soya. The PMB had an organised purchasing network operating throughout the island, including the Mahaweli areas, whereas the other organizations purchased their requirements over a short period at the end of the Yala season and therefore did not need a permanent purchasing network. Agreements were worked out with these buyers to guarantee fairly sizeable quantities of chillie, soya and maize. This left only a small quantity for local sales which helped to keep prices high.

Another important marketing strategy was the establishment of Export Production Villages in System "H" where green chillies have been exported, since 1984, to the Middle East. Exports of egg plants, okra and water melon to the Middle East and Maldives, and Gherkins to Australia, were started with the produce from System "C".

5. Demonstration and Experimental Farms

The Mahaweli Economic Agency has set up Demonstration and Experimental Farms where research in the different aspects of the cultivation of some of the new crops that could be grown in the Mahaweli areas, is carried out. Here various crops are cultivated, and subsequent to the research being carried out, details of the yield potential; optimum fertilizer levels to be used; possible pests and diseases; consumptive rates of water; labour requirements, etc., are established. The purpose of this type of experimentation of a variety of crops is that if, in the future, a market for any of these crops is obtained, the technology of the cultivation of this crop is available without it being necessary to go through

the whole experimental process which would take a number of years. Crop profiles for the crops that have been researched, are now being prepared on this basis.

The Mahaweli Economic Agency has received assistance from many countries, especially China, the EEC, Israel, Japan and the United States, to carry out its various research projects. The International Irrigation Management Institute included the Mahaweli Economic Agency in its Network of researchers in Irrigation management for crop diversification in rice-based systems.

6. Study Tours Abroad

Though each of the different Mahaweli Projects have conducted their own competitions, it was decided in 1986 to conduct a bigger competition to encompass the farmers in all the projects. This was called the Mahaweli Maha Govi Paula competition and was designed, not only as an agricultural extension exercise but was also to assist in the total development of the settler family. A winner and seven runners-up were chosen after the inter-project level competition. The competition started at the Unit level and came through Block level and Project level competitions. The eight leading farmers thus chosen were sent to Thailand on a study tour — these tours have been organised since 1986.

In Thailand the Mahaweli farmers were exposed to the fast developing small farmer agriculture in that country and also to the diversity of its agriculture. The farmers spend two weeks in Thailand on their tour, the itinerary of which has been carefully worked out. On the follow up we find that these tours have been extremely beneficial to the farmers who have adopted a number of methods and techniques they have observed. The demonstrative effect of their work on their fellow farmers has also been positive. Some of the more articulate of these farmers are now being used for extension work by the agriculture extension officers of the MEA.

Intermediate Season

With the objective of giving the farmers in System H an additional income, the Mahaweli Economic Agency (MEA) orga-

nized a short duration cultivation in the follow period between the Maha 89/90 and the Yala 90 seasons. Pulses were encouraged as their crop/water requirement was less, the crop short-aged and cultivation costs low.

Soon after the Maha 1989/90 rice harvest in System H, over 250 acres of land were sown with Soybean, Cowpea and Green Gram. With no tillage the seed was just dibbled into the soil in an effort to use the residual moisture in the field. This *Meda* or a middle cultivation, also called sandwich cropping, proved a success in terms of farmer enthusiasm, farmer incomes and agricultural production potential. It is hoped to increase the acreage under this type of cultivation after the Maha 1990/91 harvest as well, using the experiences that have been gathered in the past effort. Most farmers made over Rs. 6,000.00 per acre from this cultivation. These successful cultivations gave farmers the incentive and confidence to cultivate more OFCs in the Yala season that followed.

In Table 1 details of the extents cultivated and the estimated production in respect of the different crops that were diversified into by the farmers in the different Mahaweli systems, are given.

Future Directions

The present policy of the government is a continuation of its existing policy of encouraging a high level of self-sufficiency in rice with crop diversification in Yala. Crop diversification however is not a policy that is actively pursued. It is very important that the government recognizes the fact that this country is presently facing a plateauing of rice yields in the foreseeable future and that water shortages are experienced in Yala in most areas. Increasing the incomes of the farmers is an objective of the government that needs to be actively pursued. These factors together make it very necessary for a definite policy of diversification in agriculture which includes crops, livestock and agro-industries. Crop diversification includes other field crops for the local market and high value crops for import substitution and for export, and support systems for value added activities in the rural sector.

Crop Diversification must now be viewed in an expanded perspective. No longer should it remain as a necessity dictated by limitations in irrigation potential, but rather as an opportunity for more productive land and water use through high value crops and better technologies. The vehicle for this development must be to move to high value export crops from the emphasis hitherto given to a narrow range of other field crops which are limited by low prices.

Effective crop diversification must necessarily be a process of dynamic adjustment to a number of factors that keep on changing. Positive responses to changing markets are necessary and also to price fluctuations within existing markets. Technologies keep changing and improving constantly. Fluctuating weather patterns and water availability make it necessary for a great degree of flexibility in cropping patterns. These necessitate a constant and on going review of diversification policy and changes to this policy made in response to new situations that develop. A static cropping program or target for diversification cannot therefore be maintained.

Crop diversification is a continuous process where the target is always moving. The choice of the non-rice crops which should replace rice, depends on the relative returns from these crops, which in turn depends on market prices. As prices change, farmers must be able to shift quickly from one crop to another. Diversified cropping therefore is in sharp contrast to rice monoculture where a policy target, such as rice self-sufficiency, can be a clear-cut and stationary one.

For farmers to be able to diversify effectively and profitably from rice to the cultivation of other crops a number of factors have to be considered. They are:

(a) Marketing

A steady flow of market information should be easily available for farmers to respond to market signals when choosing the crops that they should cultivate. Market information includes the quantities and times at which the different products are needed both here and abroad, together with the prices they com-

mand. All marketing information must be current and accurate if it is to be of any use in decision making. The objective therefore is to have a regular flow of information reaching all those interested.

An efficient marketing system is necessary if agricultural production is to be market responsive. A marketing system includes provision of inputs, storage, transport and sale of outputs. Farmers having the flexibility to choose the crops to cultivate, should be backed up by the ability to obtain the necessary inputs and to market their outputs profitably. The need is to have the inputs available in the quantities required, easily available and at the right time. In the initial settlement phase the supply of inputs is done by the MEA. With commercial activity consolidating itself in the various Block areas in the Mahaweli projects, the supply of inputs is taken over by the private trade. However as far as inputs for diversified crops are concerned this function will again have to be handled by the MEA till the local suppliers see the profitability of stocking these items. The MEA, is making stores space available to anyone who wishes to store his produce. Cold rooms are also being developed.

(b) Irrigation Flexibility

Rigidities are presently characteristic of irrigation systems management. Irrigation flexibility means the ability to offer the farmer choices in the quantity of water he can use, choices in the duration of irrigation issues and the ability to choose different periods of irrigation. Irrigation flexibility therefore is not merely an ability to irrigate a crop that all other farmers have changed over to from rice.

To cater to this an irrigation system option is needed. Either a system which caters adequately to both paddy and to less frequently irrigated other crops, without intolerable losses or efficiency, has to be designed or consideration given to independent systems designed for paddy areas and for diversified cropping areas.

The development of high quality, high value crops and their production in adequate and profitable quantities will require and justify the provision of year-round irrigation, which can cater sufficiently to the growers demands for water. Year-round irrigation is practiced in some countries but has not been tried out in Sri Lanka as yet. The conditions necessary for year-round irrigation,

which are the ability to carry out canal maintenance whilst issuing water together with reduced conveyance losses and water waste, have to be created. Year-round irrigation does not necessarily mean that all the farmers will cultivate crops throughout the year. Water for cultivation will be taken only when crop cultivation makes it necessary.

(c) Agronomic Data

When market information helps to identify a crop or crops that would be profitable, it is necessary for the farmer to know whether these crops can be cultivated in the Mahaweli areas. A farmer, or a commercial investor for that matter, cannot spend two or three years in trying to find out whether a particular crop can be cultivated profitably.

Several studies have examined the potentials for different crops that would fit into an effective program of diversification. These reports identified a number of promising candidate crops. The constraint that shows out strongly in regard to these studies is the relative paucity of "an ground" information on crop performance.

TABLE 1
CULTIVATED EXTENTS AND ESTIMATED PRODUCTION IN MAHAWELI AREAS (SYSTEMS B, B, C, G)

Crops		1980	1980/81	1981	1981/82	1982	1982/83	1983	1983/84	1984	1984/85	1985	1985/86	1986	1986/87	1987	1987/88	1988	1988/89	1989	1989/90	1990	1990/91
		Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha (Prox.)
Paddy	Cultivated Ex. (Ha.)	4784	15383	6815	20513	2574	33460	9859	36923	23418	41452	18482	43808	19335	47682	21015	53229	23825	60056	23137	54295	34591	-
	Estimated Prod. (MT)	10709	60446	14366	41703	5698	125807	32295	124475	61391	174138	58438	187398	60988	221797	71498	204180	80705	151556	186556	85438	117688	-
Chilli	Cultivated Ex. (Ha.)	746	-	1710	-	1800	251	2609	861	5336	338	7634	735	11816	301	3826	324	8342	1078	2865	1304	9942	524
	Estimated Prod. (MT)	1007	-	2309	-	1621	156	3522	611	7204	286	10105	633	15951	266	5164	315	11262	1543	3866	1715	13348	436
Cowpea	Cultivated Ex. (Ha.)	385	-	406	-	1137	5	194	369	302	406	643	682	685	501	1323	582	667	288	410	452	442	533
	Estimated Prod. (MT)	606	-	640	-	1791	7.5	307	581	476	375	1013	700	1077	514	2059	632	1064	454	619	456	611	461
Green Gram	Cultivated Ex. (Ha.)	70	-	86.6	-	44.5	62	180	341	266	182	562	110	680	303	1351	250	646	172	1163	271	1209	206
	Estimated Prod. (MT)	78.7	-	97.3	-	50	35	202	250	298	150	631	123	764	262	1518	218	727	165	1307	189	2013	138
Maize	Cultivated Ex. (Ha.)	-	-	-	-	-	280	-	2321	-	1987	-	1814	-	1847	-	2799	-	900	-	3811	-	4098
	Estimated Prod. (MT)	-	-	-	-	-	218	-	2978	-	3040	-	2776	-	2825	-	4281	-	1376	-	3438	-	7090
Ground Nuts	Cultivated Ex. (Ha.)	7	-	4	-	-	47	78	73.5	20	209	74	360	92	1061	181	850	10.5	210	55	432	51	
	Estimated Prod. (MT)	8.6	-	4.5	-	-	53	87	82	22	236	75	405	92	1193	193	955	11.8	236	66	881	55	
Soyabean	Cultivated Ex. (Ha.)	35	-	217	-	5	94	385	300	55	40	116	76	122	23	300	66	170	6	58	36	210	27
	Estimated Prod. (MT)	50.5	-	312	-	7	68	556	274	79	29	167	72	176	20	432	89	244	9	65	20	227	20
Red Onions	Cultivated Ex. (Ha.)	25	-	31	-	15	9	20.5	7	35	304	136	12.5	85	62	452	118	194	34	155	69	109	15
	Estimated Prod. (MT)	225	-	279	-	137	83	184	32	314	2715	1239	74	765	468	4071	877	1746	305	1295	328	990	141
B'Onions	Cultivated Ex. (Ha.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	43	-	90.5	1	170	-	
	Estimated Prod. (MT)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	81	387	-	814	9	1605.5	-	
TOTAL	Cultivated Ex. (Ha.)	6052	15383	9270	20513	5076	34161	13296	41200	29486	44728	27782	47882	33683	50801	29328	57558	34737	48545	28099	60297	46805	5454
	Estimated Prod. (MT)	12685	60446	18008	41703	9304	126375	37119	129288	69844	180755	72019	191851	80126	226244	85935	210856	79080	155420	194858	91660	137365	8341

AGRICULTURE

(d) Agricultural Inputs

The supply of agricultural inputs to the Mahaweli areas has hitherto been quite straight forward. With the quick change over to different crops by different groups of farmers there will be varying demands for seed material, different types of agro-chemicals and fertilizer. Suppliers will not know what stocks to carry, when they should be available and in what quantities they would be required. If the necessary inputs are not available in time, at convenient outlets and in the required quantities the cultivation of high value crops, with lower than potential yields, will not be profitable. It would therefore be necessary for the Mahaweli Eco-

nomnic Agency to monitor the cultivation programme from its planning stage and make arrangements to have the required inputs available in their Block stores in time. The MEA has the experience to do this as they initially supply inputs necessary for rice cultivation by the settlers when they first come in.

(e) Planting Material

A major agronomic constraint is the non-availability of planting material of the new crops identified by market studies. As commercial agriculture has not been developed in this country, the seed production industry has not made any progress. Except for rice and potato, no seed

material is produced in large quantities. It is therefore necessary to establish a line of seed supply and also to encourage the production of certain identified seed in this country. For example with the difficulties faced when trying to obtain Big Onion seed, the Mahaweli, with technical assistance, developed the technology to produce Big Onion seed. This technology however has yet to be developed to commercial levels. With the potential for diversification there is also a lot of scope for commercial nurseries in the Mahaweli areas.

(f) Post Harvest Activities

In addition to developing agronomic capability for each promising

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candidate crop, it follows that closely associated is the need for evolving suitable harvesting and post-harvest storage methods. To provide for even longer term storage and to utilize possible production surpluses, a strong emphasis needs to be placed simultaneously on developing processing and preservation capability. With its Pre-Investment Programmes the MEDs Project is attempting to develop, for the benefit of all those interested, post harvest technologies for different crops. This will enable producers to get a better

hold of the markets with better quality products.

Summary

All future strategies for crop diversification necessarily need to have a number of components. The Agronomic aspects will identify crops, cultivation technologies and the crop/water requirements of the crops that have been decided upon. The major components of the irrigation aspect of crop diversification are the conveyance systems and the management system that has to be in place to cater to the different needs of the new crops. One of the major factors that assist in the determination of crops

for diversification is the availability of Markets. Not only are decisions of the crop type based on market projections but also, the time of cultivation depending on the 'market windows'. The availability of inputs, storage and transport facilities, post harvest and processing technologies are also important factors that determine the crops to be cultivated. The final and deciding factor in choices for crop diversification is the economic value of the crop to the cultivator. Economic evaluations gives the options and crop choice. Consideration of all these factors gives the farmer the ability to make bold decisions and the ability to adopt dynamic diversification strategies.