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# Maize Production in Sri Lanka

Report Prepared for AgEnt

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**The Agro-Enterprise Development Project**
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S. Natesan
T. Jogaratnam
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## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AgEnt | Agro-Enterprise Development Project |
| AD | Assistant Director |
| AI | Agricultural Instructor (Extension) |
| AMI | Advance Marketing International Ltd. |
| BOI | Board of Investment |
| CAI | Ceylon Agro Industries Ltd. |
| CGE | Ceylon Grain Elevators Ltd. |
| DACMET | DOA, AgEnt, CGE/CAI, Maize Extension Trialling (collaborative program) |
| DAS | Department of Agrarian Services |
| DOA | Department of Agriculture |
| FMRC | Farm Mechanisation Research Centre, MI |
| MI | Maha Iluppallama |
| NEP | North-Eastern Province |
| OFC | Other Field Crops |
| SCOR | Shared Control of Resources Project (IIMI) |

## EXECUTIVE SUMMARY

Due to the rapid expansion of the poultry industry within the last ten years, the demand for maize has increased substantially. Local production of maize had not kept pace with the demand and in 1995, 80,058 m.tons were imported at a cost of Rs. 634.7 million. The need to replace imports with local production is now a major policy objective. Maize yields using traditional farming practices range from 1100 to 1400 Kg/ha and the task of raising output on large numbers of small scale holdings and organising marketing is not an easy one. It is against this background that AgEnt, devoted to the promotion of agribusiness projects, has sought to coordinate the activities of the producers and millers as well as the DOA and promote the domestic production of maize, thereby hoping to increase supply and reduce dependence on imported grain, as well as to reduce overall cost.

The initial step in this direction was the collaborative maize production/trial kit programme conducted in Maha 95/96 season in Anuradhapura, Ampara, Badulla and Moneragala districts. The total cost of this programme was Rs. 2,540,000 shared by AgEnt (48%), CGE and CAI Ltd. (34%) and DOA (18%). Using the improved technology, 475 kits (each sufficient for 1/10 ha) were distributed to leader farmers in the four districts. These field demonstrations carried out with involvement by AgEnt, DOA and CAI Ltd. were intended to demonstrate the economic benefits of improved technology (improved varieties, fertilizer and plant population at around 55000 plants/ha) and to create an awareness among other "follower" farmers in the vicinity as well as to establish a linkage between the growers and the millers.

This study was undertaken to assess the impact of the strategy, the economic benefits of the new technology, its acceptance by farmers, identify the strengths and weaknesses and to indicate future directions for a sustained collaborative programme of maize production for the feed industry. Assessment of the performance in relation to the objectives set was made by an analysis of the results of the production trial kit programme as reported by the participating farmers and by discussions with the concerned farmers. The yield data from 250 locations showed that the overall mean yields for the open pollinated and hybrid varieties were 6.37 and 7.34 tons/ha respectively. The results of the demonstration plots, though

limited in scope, have been very encouraging. They indicate that yields could be more than doubled. The package is financially very attractive, but farmers have not always kept to the terms of the agreement to sell at prearranged prices to the feed millers concerned, due to better market prices consequent to the partial drought and loyalty to traditional purchasers. While farmers benefit from the higher incomes, millers are concerned about the recovery of credit which is possible only if the grain is sold to them. It would however be unrealistic to expect that the results from small plots under well managed conditions could be duplicated over larger areas owing to the variations in environmental conditions, risks involved, and the difficulties farmers face in obtaining the inputs. But even moderate yield increases would make maize cultivation attractive. The macro statistics indicate a steady expansion in maize cultivation. In the face of the decline in projected world prices, there is an urgent need to keep maize even more competitive than it is at present.

As part of the rapid appraisal, 141 farmers consisting of both "leader" and "follower" farmers were contacted. Nearly 90% of the leader farmers and follower farmers who were interviewed expressed their desire to adopt the new technology. It is this interest that led to an increased number of collaborative projects in Yala 1996 and Maha 1996/97 seasons. Details are given in Chapter IV. Statistics on the adoption of such improved practices in maize production are meagre but the available figures show that in Moneragala district, the extents under improved practices have increased from 329 ha (Yala 1994 and Maha 94/95) to 1471 ha (Yala 1996 and Maha 1996/97) and increased from 131 to 286 ha in Mahiyangana. The numbers of farmers adopting such practices has also trebled in both areas during this period. In Moneragala, the number of farmers using improved technology increased from 389 (Yala 1994 and Maha 1994/95) to 1382 (Yala 1996 and Maha 1996/97). In Mahiyangana the numbers have increased from 325 to 821.

Sustained increases in maize production, however, depend on technical feasibility as well as on economic profitability. The economic aspects of maize production and utilization were investigated. The demand for maize is an indirect demand, arising from the demand for livestock products, especially poultry. Very little of maize is consumed as human food, although in recent years, there has been an increase in the consumption of green cobs. However, no quantitative estimates are available. Given the high income elasticities of

demand for livestock products, and the government's expectations of rapid increases in per capita incomes, the demand for livestock products could increase by as much as 5 to 7 percent per annum, other things remaining the same. At present more than half the requirements of maize for livestock feed is imported. Such imports could increase dramatically if domestic production does not respond sharply.

Maize is cultivated as a rainfed crop in the Maha season. It has to compete with a number of other field crops. An analysis of the cost of production data available form DOA suggests that net farm earnings from maize is comparable with those of most other crops, except for chillies, potatoes and vegetables, the last being confined mostly to the Badulla district. These are commonly referred to as high value crops and make heavy demands on labour and capital. Maize cultivation as traditionally practised makes very little demand on capital or labour, but at the same is characterised by low yields. This situation can be changed by wider implementation of the successfully demonstrated new maize technology program.

Producers did not complain of any problems in disposing of their produce, though it is evident it is at a lower price. The informal credit system in place ensures that the producer sells to the local boutique keeper/mudalali.

The strategy has as its ultimate goal, the sustained production of maize at higher levels of productivity and farmer income. The conclusions arrived at during, this study indicate that for sustained production, the following are necessary.

1. Seeds and fertilizers should be readily available to farmers and preferably on credit terms. Local traders, banks, millers and NGOs provide some credit but the rapid appraisal indicated that this is short of the requirements.

2. In areas where farmer organisations/cooperatives do not function, the farmers have to be organised into groups for production, input supplies distribution and produce marketing. The private sector should play a leading role in this regard.

3. Contract farming schemes should be supported at the initial stages through training of participants and by incentives such as revolving credit schemes.

4. The use of simple demonstration minikits and intensive farmer training, in high potential areas, would favour the rapid spread of new technology.

5. The Monitoring and Evaluation System has to be improved to obtain more reliable data on the impact of the maize program.

6. Government policies should support the opening of large farms by private entrepreneurs for commercial production of maize, soybean, sorghum and other similar crops by allocation of suitable land and by grant of concessions on imports of machinery and inputs.

7. A greater degree of involvement by the Agrarian Services Department and Provincial Ministries of Agriculture (which oversee and support the planning and implementation of agricultural programs in the districts) would be vital for the success of contract farming. This would be of particular help at the early stages before large scale involvement by the private sector.

In the light of what has been stated, the major recommendations are presented below:

1. The feed industry should be the leader in promoting maize production. The industry should sustain itself by operating contract farming schemes with collaboration from the private sector, banks, marketing agencies, farmer organisations and NGOs.

2. Farmer Organisations and Co-operatives should be involved in organising contract farming, and to perform input supply and produce marketing functions. DAS official should participate as a member of the collaborating team and ensure that adequate marketing funds are made available to the participating farmer organisations for stocking inputs in time.

3. In areas where Farmer Organisations/Co-operatives are not effective, DOA extension staff, NGOs and private sector companies with vested interest in increased maize production could organise farmer groups (Maize Growers Association), and train and assist such groups to perform input supply and marketing functions.

4. As a step towards the introduction of contract farming in new areas, Group/Block demonstrations should be organised and supported by sharing the cost of fertilizers. The private sector seed industry should be involved in contract farming schemes with technical support by the DOA for production of quality seeds. The national seed policy supports private sector involvement in the seed industry.

5. To support the Farmer Organisations/Co-operatives in servicing needs of farmers in contract farming areas, a Revolving Credit Fund could be created by imposing a levy of, say, Rs. 100/- per ton of imported maize. This revolving credit fund should be allocated to Farmer Organisations/Co-operatives in high potential areas in all maize growing districts to provide seeds and fertilizers to farmers on credit on the basis of their past performance, willingness to adopt improved technology and to sell the produce to millers. CAS should supervise the use of this credit. This would supplement other sources of credit and serve as an incentive for promoting maize production.

6. To promote rapid spread of technology in high potential areas, simple demonstration mini kits (with one variety and single fertilizer level) should be distributed to farmers and intensive farmer training should be mounted to convince farmers of the profitability of new technology over the traditional ones. Video films could support this effort. These demonstration kits are best prepared in the districts rather than in a central location and DOA should allocate funds from Central Government votes to the provincial extension services for this purpose.

7. The support of the Department of Census and Statistics should be sought to devise a methodology for obtaining more reliable statistics on extents, yields and on the impact of the programme. DOA should maintain these statistics. In order to collect input

-output data on a sustained basis, an economist should be associated with the collaborative program.

8. Government policies should support the opening of large farms by private entrepreneurs for the commercial production of maize, soya, and sunflower. Suitable land should be identified by DOA and made available and import duty concessions should be given for imports of farm machinery and inputs, as well as building materials for construction of the necessary buildings.

9. The DOA in association with other relevant institutions should operate a marketing extension service that would train the Farmer Organisations, Co-operatives, public sector officials and millers' representatives in improving marketing efficiency, in providing market information and in strengthening the marketing linkages between farmers and marketing companies.

10. Much higher levels of activity are expected from the collaborators and their agents. Their roles have been spelt out in a separate section in Chapter V.

11. Expedient action is necessary between the private sector and the DOA to resolve seed import issues which are restricting the introduction of improved plant varieties with increased yeilds which make maize production more attactive profitably to small farmers.

12. More current information is needed in the real cost of small farmer maize production using improved technology.

# MAIZE PRODUCTION AND UTILIZATION IN SRI LANKA

## CHAPTER I
## INTRODUCTION

### 1.1 Project Rationale

Maize, classified as a coarse cereal, plays a relatively minor crop role in the Sri Lankan economy. It is cultivated in the Dry Zone, principally as a chena crop, in pure and mixed stands and in scattered plots, ranging in extents from a quarter acre or less to an acre or thereabouts. Consequently, the statistics relating to maize production and utilization are at best crude estimates (Central Bank 1995). In recent years the crop has assumed importance as the principal constituent of livestock feed. Economic development is associated with changes in consumption patterns, with a shift away from starchy staples to milk, meat and eggs, amongst others. If the experiences of the developed world, and especially of the newly industrialized countries (NICs) are to be of any guide, it is that increases in per capita incomes will sooner or later result in sharp increases in the demand for livestock products. This will call for increased production of maize or increased reliance on outside sources of supply.

An increase in the volume of imports of maize into Sri Lanka due to increased livestock production and meat consumption is a cause for concern. The USAID funded Agro Enterprises Project (AgEnt) in its efforts to develop agri-business so as to increase farmer/producer incomes and employment initiated a programme in the 1995/96 Maha season to increase national maize production and supplement imports. The AgEnt strategy was built on the concept of a collaborative programme with the Department of Agriculture (DOA), Ceylon Grain Elevators (CGE) Ltd. as a major miller and Ceylon Agro Industries Ltd. Maize being traditionally a small farmer crop, the integration of production, collection, marketing and end-use by feed mills was considered necessary. The Programme termed DACMET, an abbreviation of the collaborating agencies, distributed 475 production/trial kits to farmers in Anuradhapura, Ampara, Badulla and Moneragala districts in the Maha 1995/96

season. The idea was to demonstrate the effectiveness of improved technology and to increase farmers' awareness. It was repeated in Yala 1996 with 182 farmers in Anuradhapura, Moneragala, Badulla, Kurunegala, Polonnaruwa, Ampara, Kandy, Matale, Udawalawe, Hambantota, and Mahaweli Systems B, C and H.

More demonstrations were established in Maha 1996/97 season. Details are given in Section 4.4.

## 1.2 Study Objectives

The main purpose of the study reported here was to assess the impact of the strategies adopted, identify the principal accomplishments and deficiencies, and recommend future directions for the development of a sustainable programme for increased maize production. The scope of work as defined in the Terms of Reference (TOR) were to review and assess:

a) The conceptual base and the strategies adopted and suggest improvements. Relate these to similar crops having out-grower potential.

b) The strengths and weaknesses of the Production/Trial Kit program itself and suggest strategies/modifications/methods needed for the future seasons beginning Maha 1996/97 and Yala 1997.

c) The economic advantages of the introduced technologies and, importantly, the benefits resulting to the individual maize farmers. Ascertain a reasonable farm gate price range considering realistic input and production costs.

d) The degree of awareness of improved technology. The likely impact of the demonstrative effects of the programme in terms of the number of farmers reached, their acceptance of improved technology and their desire to pursue same.

e) Any shortcomings and modifications needed at the field level as well as higher levels of activity by collaborators and their agents. What would be an effective and viable model for companies to work with farmers/farmer organizations.

f) Constraints in adopting, demonstrating technologies.

g) Farmer perceptions of private sector extension/support services in areas where they are provided and how best public and private sector services could be linked.

h) AgEnt's future role in furthering its objectives on maize production and utilization as well as on related crops of out-grower potential.

## 1.3 Study approach

A study of the nature outlined above requires information on production, distribution, and utilization of maize, maize products and substitutes. An enquiry into the potentials and future prospects requires a good understanding of the technical, economic and social factors influencing both human consumption and animal feed requirements as well as the production environment and the manner in which it is organised. Both aggregative and micro-level information would be required and data that is adequate in coverage and reliable is necessary. Unfortunately, the TOR restricts the study to a rapid rural appraisal which at best enables only qualitative judgements and not quantitative estimations. Secondary data is limited in scope and lacking in depth and reliability. In the circumstances, the best that could be done was to rely on discussions with concerned officials and agencies and with some of the farmers, and supplement with secondary sources of information. Moreover, one seasons' trial or two, covering a few hundred farmers, whose representativeness is not at all clear, does not constitute a basis to arrive at informed judgements. All that can be expected from this study is an awareness of the broad dimensions of the problem of increasing maize production in Sri Lanka.

## 1.4 Methodology

Initially, secondary data and information relating to the subject were made available in the form of memoranda and reports by the Production Advisor, AgEnt. Additional information was also obtained from the Task Force and the Field Crops Research and Development Institute, Maha Iluppallama. A series of meetings and discussions were held in December 1996 with senior management personnel of the feed milling companies - AMI Ltd., CAI Ltd., Gold Coin Feed Mills Ltd., Master Feeds Ltd., Mandarin Farms Ltd., Nutrena Ltd., Superfeeds Ltd., and New Bernards Animal Feeds Ltd. Their experiences in collaborative projects during the last two seasons and their views on future collaboration were obtained.

This was followed by short field visits to sites in Anuradhapura, Mahiyangana, Padiyatalawa, Huruluwewa, and Moneragala to observe mainly the Maha 96/97 demonstrations in the field and meet farmers. The consultants met some of the farmers who participated in the DACMET program as well as some others ("follower" farmers) who were exposed to new technology demonstrated under the Maha 1995/96 DACMET program. During the visits to the districts mentioned, the team was also able to discuss related aspects with DOA Research personnel (MI), Extension personnel (Provincial and Interprovincial), Project Manager (SCOR Huruluwewa), FMRC MI personnel and with field staff of CAI Ltd. and Advance Marketing International. Further field visits were made during February and March 1997 to the areas mentioned earlier with the traditional maize growers as the focus of attention. Attempts were also made to collect cost of production data, although the numbers so contacted were far too few to arrive at firm conclusions. In addition, contact was also made with concerned officials in the districts.

## 1.5 Organization of Report

Following on the introduction presented in this chapter, chapter II takes up for consideration the future demand for maize in Sri Lanka. The demand for maize, both as human food and animal feed are considered, and as is to be expected, the demand for maize is primarily dictated by the demand for livestock feed. The focus of this chapter will therefore be primarily concerned with the future demand for livestock products, especially eggs and poultry meat. Chapter III examines, to the extent possible in the context of data limitations, the potentials for increasing maize production. Supply prospects will be determined primarily by considerations of profitability, not only of maize but of other crops competing not only in end-use but of land use as well. Also considered will be the economics of the new package, very limited in scope though it may be. Chapter IV deals with the accomplishments of the collaborative program carried out during Maha 1995/96 and the two subsequent seasons. The major issues that affect sustained production are discussed in this chapter. The conclusions arrived at and the recommendations are presented in Chapter V.

# CHAPTER II

# FUTURE DEMAND FOR MAIZE

2.1 The principal determinants of demand are population, incomes, own price, and prices of competing products. Other factors, such as changes in tastes and preferences, also influence demand but are not normally considered as important, at least in the short run. Maize is utilized as human food and animal feed and projections of future demand must be based on estimations of the direct demand for human consumption, as well as a constituent of animal feed. This will of course require estimates of future demand for animal products. Table 1 presents information on trends in levels of per capita consumption of maize as well as of eggs, poultry, pork and beef. Future demand will be influenced by the rate of growth of population as well as by increases in incomes. If per capita consumption is assumed to remain constant, that is if it is assumed that the income effect is nil or negligible, then demand could be expected to increase in proportion to the increase in population. This ignores the effect of changes in age and sex composition of the population, but these are held to be negligible over a five to ten year period. The rate of growth of population in Sri Lanka could be expected to range between 1.2 percent per annum at present to about 1.0 percent per annum over the next 5 to 10 years. Projections over a 10 year period are beset with many uncertainties and difficulties.

Table 1: Per Capita Consumption per Month of Selected Food Items: Sri Lanka 1981/82 and 1986/87 (All Island)

| Food Item | 1981/82 | 1986/87 |
|---|---|---|
| Maize (gms) | 42.3 | 21.9 |
| Beef (gms) | 128.6 | 98.5 |
| Mutton (gms) | 14.9 | 6.8 |
| Pork (gms) | 13.4 | 12.6 |
| Chicken (gms) | 12.8 | 29.7 |
| Eggs (no) | 1.0 | 2.2 |

Source: Central Bank, 1982. 1986.

2.2 It would be highly unrealistic to assume that incomes will stagnate or increase only imperceptibly over the next 5 to 10 years. Past evidence suggest that the economy grew at rates of 1.0 to 2.0 percent per annum in the sixties to eighties. Partial liberalisation and heavy investments in irrigation development appear to have increased growth rates to around 4.5 percent per annum. It is not impossible that the next ten years or so will see Sri Lanka achieving average rates of growth in per capita incomes of the order of 8-10 percent per annum. This however requires the satisfaction of several conditions which it is impossible to deal with here. Suffice to say that a consistent increase of incomes of the order of 5 percent per annum have vital implications for the livestock industry directly and for maize production indirectly.

2.3 The income-consumption relationship is expressed in terms of elasticity coefficients which measure the effect of a one percent change in incomes on consumption. In general, the income elasticity of demand for maize for human food is expected to be very low or negative, despite the recent popularity of green cobs as a novelty food item. To suggest that the economics of production favours farmers selling their output as green cobs is indicative of a thorough misreading or lack of understanding of the economics of peasant production in Sri Lanka.

2.4 On the other hand, income elasticities for livestock products could be well over 1.5. Central Bank estimates based on surveys of consumer expenditures, which unfortunately have not been updated after 1985/86, suggest income elasticities of 1.75 for meat. Studies based on earlier data suggest even higher orders of magnitudes. Given a population growth rate of about 1.2 percent per annum and per capita income growth of about 5.0 per annum and an estimated income elasticity of about 1.5, demand for livestock products, especially meat, could grow by well over 7.5 percent per annum. Such estimations should however be treated with considerable caution. As Table 1 indicates, the effect of increasing incomes appear to have had little influence on per capita consumption of meat, except in the case of poultry. Human consumption of maize as well as of beef, mutton and pork have in fact declined whereas the consumption of poultry meat reflects an apparent increase from 12.8 gms

per head per month to almost 30 gms. This pattern of consumption also contradicts the experiences of Taiwan and South Korea where consumption levels have registered sharp changes since the 1960s, as shown in Table 2. Perhaps one important consideration here is the role of price and price elasticities. It is well known that "luxury" food items are confronted with an elastic price response and spiralling price may well dampen consumer demand. This brings into sharp focus the need to increase productivity and keep costs down. This takes one to the supply side of the equation.

Table 2: Changes in Per Capita Food Consumption of Selected Food Items: A Comparison Between Sri Lanka, Taiwan and South Korea

| Country and Year | Cereals (Kg/yr average) | Meat (Kg/yr average | Calories | Protein (gms) |
|---|---|---|---|---|
| **Taiwan** | | | | |
| 1950-52 | 140 | 11.2 | 2068 | 47 |
| 1970-72 | 165 | 26.3 | 2653 | 73 |
| 1980-82 | 134 | 40.6 | 2706 | 77 |
| **South Korea** | | | | |
| 1961-65 | 178 | 3.6 | 2147 | 55 |
| 1969-71 | 207 | 5.2 | 2539 | 67 |
| 1979-81 | 205 | 14.7 | 2895 | 82 |
| **Sri Lanka** | | | | |
| 1961-63 | 135 | 1.9 | 2149 | 48 |
| 1988-90 | 130 | 2.2 | 2282 | 53 |

Source: Sarma, J.S., 1986.

2.5 In regard to projections of future demand reference is made to a relatively recent exercise in estimating future demand and subjecting it to qualitative judgements (Wickremasinghe and Pattie, 1992). Using models based on demand equations, it estimates that per capita consumption of eggs would increase to nearly 60 eggs per

annum and poultry to 1.66 Kg per annum by the year 2000. Feed and maize requirements are then projected on the basis of these consumption estimates. The projected maize production and requirements to the year 2000 are shown in Table 3. The study accepts the possibility of underestimating demand and overestimating supply, but the preceeding discussion points to an overestimation of demand. The supply prospects are assessed in the next section.

Table 3: Projected Maize Production and Requirements

| Year | Production (MT) | Requirement (MT) | Production as % of Requirement |
|---|---|---|---|
| 1991 | 51,456 | 80,728 | 60 |
| 1992 | 52,904 | 91,234 | 58 |
| 1993 | 54,352 | 97,018 | 56 |
| 1994 | 55,800 | 103,093 | 54 |
| 1995 | 57,248 | 109,473 | 52 |
| 1996 | 58,696 | 116,174 | 51 |
| 1997 | 60,144 | 123,209 | 49 |
| 1998 | 61,592 | 130,595 | 47 |
| 1999 | 63,040 | 138,349 | 46 |
| 2000 | 64,488 | 146,489 | 44 |

Source: Wickremasinghe and Pattie, 1992 (a).

# CHAPTER III
# PRODUCTION TRENDS AND POTENTIALS

## 3.1 Maize in the Economy

Maize is a relatively insignificant crop in the context of the overall food economy of Sri Lanka. Rice, the single most important crop, occupied an average annual extent of 730,000 ha in the years 1989-92. In comparison, maize was reportedly cultivated in an area of about 45,000 ha in 1990-94. Maize is among a variety of other field crops (OFCs) cultivated, but is the most important in terms of extents covered. The crops in this group range from manioc, sweet potatoes and potatoes amongst tuber crops; cowpea, green gram and black gram amongst the pulses; chillies and onions amongst the condiments; maize, kurakkan and sorghum amongst the cereals; and sesame and soyabean amongst oil seeds. These are largely cultivated under chena conditions in the Dry Zone and belong to the food crops category. In recent years attempts have been made to promote their cultivation, especially some of the higher value crops such as chillies, onions and soyabeans under irrigation. Since much of the cultivation is in small plots and homegardens and carried out under rainfed conditions, annual variations in terms of extents and production are large and statistics unreliable. The available information for selected crops is presented in Tables 4 and 5. As mentioned earlier, maize is the single most important crop amongst the OFCs, and along with a few other crops, has recorded a steady increase in extents cultivated. However, for maize, as well as for most of the other crops, there has been no marked increase in productivity over the period 1972 - 1995. There has been no break through in technology by way of higher yielding varieties, at least at the farm level. This is in marked contrast to the situation in rice. References have been made to the plateauing off of yields in recent years but research stations report potentials for further increases in yields in the years to come. Technology transfer in the case of some of the OFCs appear to be in the very early stages and it is in this context that the DACMET programme appears significant.

Table 4: Other Field Crops (OFCs): Average annual extents cultivated (000 ha)

| Crop | 1972-74 | 1975-79 | 1980-84 | 1985-89 | 1990-94 | 1995 |
|---|---|---|---|---|---|---|
| Maize | 34.3 | 31.2 | 37.8 | 40.2 | 46.7 | 45.9 |
| Chillies | 37.1 | 34.2 | 28.2 | 31.3 | 37.3 | 28.1 |
| Red Onions | 6.6 | 6.8 | 8.7 | 9.4 | 7.9 | 7.6 |
| Ground Nut | 7.2 | 6.9 | 11.8 | 10.0 | 11.1 | 12.5 |
| Green Gram | 8.4 | 11.4 | 22.3 | 27.8 | 38.3 | 24.0 |
| Soyabean | 0.9 | 1.3 | 9.4 | 5.7 | 2.9 | 3.0 |
| Big Onion | 0.2 | 0.2 | 0.1 | 0.5 | 3.6 | 4.4 |
| Potatoes | 2.5 | 3.4 | 6.0 | 7.4 | 6.5 | 9.0 |
| Sesame | 14.4 | 25.6 | 25.6 | 15.3 | 12.4 | 5.0 |
| Cowpea | 5.9 | 25.5 | 35.3 | 27.7 | 25.0 | 21.3 |
| Blackgram | 1.7 | 11.9 | 15.9 | 13.2 | 11.8 | 15.0 |

Source: Central Bank, Annual Reports (various)

Table 5: Other Field Crops (OFCs): Average Annual Yields (MT/ha)

| Crop | 1972-74 | 1975-79 | 1980-84 | 1985-89 | 1990-94 | 1995 |
|---|---|---|---|---|---|---|
| Maize | 0.7 | 1.1 | 1.1 | 1.1 | 1.2 | 1.5 |
| Chillies | 0.5 | 0.8 | 0.9 | 1.1 | 0.9 | 1.0 |
| Red Onions | 10.8 | 9.6 | 9.9 | 9.3 | 11.0 | 8.7 |
| Ground Nut | 1.2 | 1.0 | 1.0 | 1.2 | 1.1 | 1.1 |
| Green Gram | 0.6 | 0.7 | 0.8 | 0.7 | 0.8 | 0.9 |
| Soyabean | 1.1 | 1.2 | 0.8 | 1.1 | 1.3 | 1.4 |
| Big Onion | 8.4 | 9.5 | 10.1 | 10.2 | 10.5 | 10.2 |
| Potatoes | 14.3 | 14.9 | 12.9 | 12.9 | 9.9 | 11.3 |
| Sesame | 0.4 | 0.6 | 0.5 | 0.6 | 0.7 | 0.7 |
| Cowpea | 0.8 | 0.7 | 0.9 | 0.7 | 0.8 | 0.8 |
| Blackgram | 0.5 | 0.7 | 0.6 | 0.7 | 0.7 | 1.0 |

Source: Central Bank, Annual Reports (various)

## 3.2 The Economics of Maize Production

The drive to promote maize production must be based on considerations of financial profitability as much as on matters of technical feasibility. This section explores the economics of maize production as currently practised and relates it to what could be expected in terms of the new technology being promoted under the DACMET programme. Needless to say, maize cannot be considered in isolation. As indicated earlier, it is one of several crops grown in the highlands of the Dry Zone and its competitive position will also have to be explored.

3.3 Table 6 provides information on maize production and imports over the period 1974-1995. While there is a marked increase in production, the variability from year to year is to be noted. It is cultivated under rainfed conditions and is subject to the vagaries of the weather. But more important is the increasing dependence on imports, which, as could be inferred, goes primarily to meet the requirements of the feed industry. Today, the country produces less than half its requirements, whereas it was self-sufficient in the early seventies. The value of imports averaged Rs. 630 millions annually over 1993-95 and is estimated at Rs. 665 millions for the first 7 months of the year 1996 (Ministry of Agriculture, 1997). The c.i.f prices have ranged from a low of Rs. 6 per Kg in 1990 to a high of Rs. 9.65 in 1992 to Rs. 7.60 per Kg in 1996 (to July only).

Table 7 presents a comparison of c.i.f. and farm-gate prices of maize. If an allowance is made for transport and handling charges of around Rs. 2.50 per Kg and a quality discount of 20 percent, then it appears that domestic production is not competitive. Sufficient information is not available to arrive at a reasonably accurate estimation of the quality differential. But millers in their discussions did indicate that local maize is of inferior quality. Donor agencies such as the World Bank and the Asian Development Bank generally accept a 20 percent quality adjustment in the case of rice.

Table 6: Domestic Production and Imports of Maize, 1979-1996

| Year | Production (MT) | Imports (MT) | Gross Availability (MT) | Production as % of Availability (%) |
|---|---|---|---|---|
| 1974 | 23,850 | 4,920 | 28,710 | 83 |
| 1975 | 34,630 | 0 | 34,630 | 100 |
| 1976 | 31,190 | 0 | 31,190 | 100 |
| 1977 | 41,990 | 0 | 41,990 | 100 |
| 1978 | 33,800 | 0 | 33,800 | 100 |
| 1979 | 26,030 | 1,000 | 27,030 | 96 |
| 1980 | 31,360 | 0 | 31,360 | 100 |
| 1981 | 35,300 | 2 | 35,302 | 100 |
| 1982 | 38,670 | 2,460 | 41,130 | 94 |
| 1983 | 51,070 | 21 | 51,091 | 100 |
| 1984 | 39,100 | 4,200 | 43,300 | 90 |
| 1985 | 33,720 | 11,277 | 44,997 | 75 |
| 1986 | 40,620 | 30,100 | 70,720 | 57 |
| 1987 | 45,230 | 13,708 | 58,938 | 77 |
| 1988 | 70,570 | 13,570 | 84,140 | 84 |
| 1989 | 36,420 | 6,930 | 43,350 | 84 |
| 1990 | 54,750 | 44,502 | 99,252 | 55 |
| 1991 | 48,500 | 53,332 | 101,832 | 48 |
| 1992 | 46,900 | 34,803 | 81,703 | 57 |
| 1993 | 69,300 | 72,561 | 141,861 | 49 |
| 1994 | 67,200 | 84,824 | 152,024 | 44 |
| 1995 | 68,850 | 80,058 | 146,758 | 45 |
| 1996 | | | | |

Source: Department of Agriculture

Table 7: Maize: A comparison of c.i.f. prices and domestic farm-gate prices, 1990-1995

| Year | c.i.f. Rs/Kg | Farm-gate Rs/Kg |
|---|---|---|
| 1990 | 6.08 | 5.80 |
| 1991 | 8.60 | 5.67 |
| 1992 | 9.67 | 7.35 |
| 1993 | 8.39 | 7.13 |
| 1994 | 6.93 | 7.28 |
| 1995 | 7.21 | 9.30 |

Source: Dept. of Census and Statistics

3.4 An assessment of farmer profitability has to be based on the cost of production studies of the Department of Agriculture. Their shortcomings are well known, but in the absence of other sources of data, they provide useful insights (Dunham, 1992).

3.5 Table 8 provides information on farm earnings for a variety of crops, computed as the difference between gross income and cash costs on variable inputs. Farm earnings represent the returns to the farm family for its labour, capital and management, and is the most useful measure of profitability under peasant farming conditions. It is also referred to as the gross margin.

3.6 Considerable caution must be exercised in using the data presented. As Dunham (1995) correctly remarks, these are average figures and information is only available for districts with the highest concentration of the crops considered. They do not reflect regional variations and areas with the highest concentration need not necessarily be the areas with the greatest comparative advantage. Given these caveats, maize certainly emerges as a competitive crop. While farm earnings may not be as high as some of the other OFCs such as groundnut and greengram, labour and capital requirements are low in comparison. Regional variations are however

Table 8: Comparison of Financial Returns of Selected Field Crops, Maha 1994/95.

| Crop | Gross Income (Rs/ac) | Cash Costs (Rs/ac) | Farm Earnings (Rs/ac) |
|---|---|---|---|
| **Paddy - Irrigated** | | | |
| Polonnaruwa (Ma) | 12,968 | 8,354 | 4,614 |
| Anuradhapura (Ma) | 11,766 | 7,302 | 4,464 |
| Anuradhapura (Mi) | 10,596 | 6,945 | 3,651 |
| Moneragala (Mi) | 10,350 | 6,155 | 4,195 |
| Badulla (Ma) | 8,467 | 5,921 | 2,546 |
| Badulla (Mi) | 8,340 | 5,466 | 2,874 |
| **Paddy - Rainfed** | | | |
| Kandy | 6,615 | 6,272 | 343 |
| Kurunegala | 8,640 | 6,218 | 2,422 |
| **Maize - Rainfed** | | | |
| Moneragala | 5,566 | 1,104 | 4,462 |
| Anuradhapura | 4,084 | 752 | 3,332 |
| Badulla | 2,738 | 768 | 1,970 |
| **Chillie - Rainfed** | | | |
| Anuradhapura | 41,032 | 6,487 | 34,545 |
| **Soyabean-Rainfed** | | | |
| Anuradhapura | 8,105 | 5,223 | 2,882 |
| **Groundnut-Rainfed** | | | |
| Moneragala | 9,182 | 2,388 | 6,794 |
| **Green gram-Rainfed** | | | |
| Moneragala | 6,024 | 825 | 5,499 |
| **Cowpea - Rainfed** | | | |
| Moneragala | 6,081 | 1,990 | 4,091 |

Source: Department of Agriculture, Cost of Cultivation of Agricultural Crops, Maha 1994/95, Peradeniya, May 1996.

marked and Moneragala district emerges as the most favourable district for maize cultivation. Crops such as chillies, onions, potato, green gram and vegetables return far higher earnings, but capital costs and labour requirements are very high. Nevertheless field observations indicate that chillie is the favoured crop in Anuradhapura even though plot sizes may be very small. But maize and other crops are also cultivated; an example of the peasant farmers' efforts to spread the risks inherent in rainfed conditions. Mention must also be made of the fact that cash costs in maize comprise mainly payments to hired labour and very little is incurred by way of material costs or on draught power or machinery, all indicative of low levels of the technology as currently practised. It is important to note, as Table 9 indicates, the low level of yields and the fact that unit costs, inclusive of imputed costs are higher than farm-gate prices of maize, except in the case of Moneragala.

Soyabean is often cited as a crop that could compete with maize. In fact, Wickremasinghe and Pattie (1992 b) indicate the relative attractiveness of the crop to farmers in view of the relatively low capital and labour demand. But subsegment developments do not bear this out.

Table 9: Costs and Returns of Maize Cultivation, under Traditional Practices, by Selected Districts, Maha 1994/95 (Traditional Practices)

| Yield/Returns | Anuradhapura | Badulla | Moneragala |
|---|---|---|---|
| Average Yield (Kg/ac) | 635 | 507 | 720 |
| Price of Produce (Rs/Kg) | 6.40 | 5.40 | 7.70 |
| Gross Income (Rs/ac) | 4064.00 | 2738.00 | 5566.00 |
| Cash Costs (Rs/ac) | 752.00 | 768.00 | 1104.00 |
| Net Returns ( Rs/ac)1/ | - 2411.00 | -3547.00 | 664.00 |
| Total Costs[1/] (Rs/ac) | 6475.00 | 6285.00 | 4902.00 |
| Per Unit Cost (Rs/Kg) | 10.20 | 12.40 | 6.80 |

Source: Department of Agriculture, Cost of Cultivation of Agricultural Crops, Maha 1994/95, Peradeniya, May 1996.

COP including inputed costs are higher than gross incomes leading to negative net returns in Anuradhapura and Badulla.

1/ includes imputed costs of family labour and capital.

3.7 The DACMET programme however seeks to demonstrate the profitability of maize production, given improved technology such as the use of improved seed varieties and fertilizer and higher plant density. The data from the 1995/96 Maha trials are presented in Table 10. Average yields increase to about 3000 Kg/acre, compared to about 600 Kg/acre under traditional practices. Total cash costs also increase, reflecting the application of fertilizers and use of improved seeds. But they nowhere approach the investment requirements for crops like onions, chillies, potato and vegetables. The financial profitability attendant on the adoption of the improved technology demonstrated by DACMET is clearly brought out in this table. However, the usual caveats are in order. The representativeness of the DACMET sample are subject to question and the number of observations are far too small for generalizations. It is well known that field trials cannot be duplicated on any large scale (Jogaratnam et al, 1977). Field observations indicate that yield levels of farmers using the improved seeds are far lower and not always accompanied by the recommended package of practices, such as levels of fertilizer application, spacing, weeding etc. Weather conditions also influence yields. As numerous studies in the developing world have indicated, improved seeds must be associated with more efficient input delivery systems, extension back-up and improved marketing. Some comments, based on field observations, follow later. Table 11 presents a synthetic budget based on gleanings from field observations. Again, one cannot overemphasize the fact that the observations are based on a very small sample, subjected to a rapid rural appraisal and demonstrated a very high degree of variation. It is the best guess of a situation, marked by the adoption of improved practices on a wider scale.

Table 10: Costs and Returns of Maize Cultivation, by Selected Districts, Maha 1995/96 (DACMET Package)

| Yield/Returns | Anuradhapura | Badulla | Moneragala |
|---|---|---|---|
| Average Yield (Kg/ac) | 2830 | 3155 | 3360 |
| Price of Produce (Rs/Kg) | 9.50 | 9.50 | 9.50 |
| Gross Income (Rs/ac) | 26,885.00 | 29,972.00 | 31,920.00 |
| Total Costs[1/] (Rs/ac) | 7,150.00 | 7,150.00 | 7,150.00 |
| Net Teturns (Rs/ac) | 19,735.00 | 22,822.00 | 24,770.00 |
| Per Unit Cost (Rs/Kg) | 2.50 | 2.50 | 2.50 |

Source: Department of Agriculture, OFC Task Force, Peradeniya, 1997.

1/ includes imputed costs.

Table 11: Costs and Returns of Maize Cultivation, by Selected Districts, Maha 1996/97 (Improved Practices)

| Yield/Returns | Anuradhapura | Moneragala |
|---|---|---|
| Average Yield (Kg/ac) | 1500 | 1750 |
| Price of Produce (Rs/Kg) | 10.50 | 10.00 |
| Gross Income (Rs/ac) | 15,750 | 17,500 |
| Total Costs (Rs/ac) | 8,500 | 8,000 |
| Net Teturns (Rs/ac) | 7,250 | 9,500 |
| Per Unit Cost (Rs/Kg) | 5.70 | 4.60 |

Source: See text for discussion.

3.8 Table 12 presents information on returns to labour and capital. The return to capital compares favourably with other crops, including the so called high value crops. In the case of Anuradhapura and Badulla, however, the return to labour is lower than the prevailing wage rate. The adoption of improved practices should bring the return to labour in Anuradhapura somewhat on par with the wage rate but Badulla would require much sharper increases in productivity.

Table 12: Returns to Labour and Capital, Maize Cultivation in Selected Districts, Maha 1994/95 (Traditional Practices)

| District | Return to Labour[1/] per Manday (Rs) | Wage Rate (Rs) | Return to Capital[2/] (Rs) |
|---|---|---|---|
| Anuradhapura | 76 | 90 | 5.43 |
| Badulla | 35 | 120 | 3.56 |
| Moneragala | 108 | 95 | 5.04 |

Source: Department of Agriculture, Cost of Cultivation of Agricultural Crops, Maha 1994/95, Peradeniya, May 1996.

Note: 1/ Return to labour per man-day is defined as profit excluding imputed costs[3/] and costs of hired labour divided by number of man-days. Profit is defined as gross returns less cost of cultivation including imputed costs.

2/ Return to capital is defined as gross returns divided by costs of cultivation excluding imputed costs.

3/ Imputed costs are the costs attributable to family and exchange labour and farmer owned inputs.

3.9 Consideration should also be given to the human consumption of maize as green cobs. The last few years have seen a substantial increase in the sale of green cobs in the urban and peri-urban areas. No quantitative information is available, but field observations indicate that farmers along the main roads harvest about 10-20 percent of production as green cobs, and realise a sale price of cents 50 to one rupee for a cob from middlemen and these are retailed to consumers at Rs. 4.00 to Rs. 5.00. Given the recommended plant density of 50,000 per ha, there is substantial profit to be made in a shorter time period. But very little information is available on the size of the market. The marketing process is also influenced by the proximity to urban areas. It is quite conceivable that the size of the market may increase, accounting for about 10-20 percent of production. Attempts are however being made to promote the production of maize in the Wet Zone to meet the demand for green cobs, but it is still too early to arrive at any conclusions.

3.10 In summary then, it would appear that a doubling of yields and extents cultivated would be required to meet from domestic sources the current levels of demand for maize. Given the prospects of sharp increases in the future demand for eggs and poultry, and for green cobs, much would depend on how fast the improved technology could be disseminated. In this context, consideration must be given to the role of prices and marketing of maize as well as the scope for further improvements in technology not only in the case of maize but for other competing crops as well.

3.11 The subject of technology is speculative at best, but it only points out to the need for a much larger scale of investment in agricultural research. On the subject of prices, World Bank projections estimate a fall in both real and nominal prices over the next five to 10 years. Given the quantum of imports and in the absence of any government interventions, the cif values determine prices that feed millers would be willing to pay. Marketing margins are presently estimated at Rs. 2.00 to Rs. 2.50 per Kg of maize, with this being the difference between Colombo retail and farm-gate prices.

3.12 Farmers in general expressed satisfaction with the present marketing arrangements. They do not appear to have any problems in disposing of their production through the local dealers/boutique keepers. They are aware that they are getting somewhat lower prices, but they are tied to the informal credit arrangements which provide both production and consumption credit. Fertilizers appear to be readily available, at least at the time the rapid rural appraisals were carried out. But farmers expressed serious reservations about the availability and quality of the seed material.

# CHAPTER IV

# IMPLEMENTATION HIGHLIGHTS

## 4.1 Maha 1995/96 - Accomplishments

The collaborative DACMET program introduced in Maha 1995/96 was undertaken in Anuradhapura, Ampara, Badulla and Moneragala districts. In all, 475 production/trial kits were distributed to selected farmers.[1] These demonstrations managed by farmers with technical guidance provided by the extension personnel were intended to demonstrate the benefits of using high yield potential varieties combined with higher plant density, fertilizer use and weed control as compared to the traditional methods. Field days were conducted at successful sites to make other farmers in the locality aware of the benefits. The field staff of CAI Ltd. functioned as "extensionists" and served to facilitate and monitor the program as well. Records were maintained by farmers and yield data (from 100 sq. metre sub plots) from 250 demonstrations were submitted by the extension officers to the Task Force (OFC). This data was subsequently analysed by the Field Crops Research and Development Institute, Maha Iluppallama. Partial failure of the rains in some parts of Anuradhapura and Moneragala district depressed yields. Available rainfall data at Okkampitiya and Maha Iluppallama support this observation (Dept. of Metereology).

4.2 The Maha Iluppallama report (Chandrasiri and Joseph, 1996) states that the overall mean yields for 250 locations for the open pollinated and hybrid varieties were 6.37 and 7.34 tons/ha respectively. The yield increase of hybrid over the local variety was 0.97 ton/ha. The yield increase due to the higher rate of fertilizer application was 0.56 ton/ha. Caution has to be exercised in extrapolating these data as it is based on one season's results and only from successful sites. A number of field days were conducted at the successful demonstration sites.

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1/ Each kit served to test 4 treatments:
1. Hybrid with high level fertilizer (Urea 250 Kg, TSP 150 Kg, MOP 75 Kg/ha).
2. Open pollinated with high level of fertilizer.
3. Hybrid with normal fertilizer (Urea 150 Kg, TSP 100 Kg, MOP 50 Kg/ha).
4. Open pollinated with normal fertilizer level.

## 4.3 Yala 1996 and Maha 1996/97 - Accomplishments

The demonstration program was repeated during 1996 Yala season with 182 farmers in Anuradhapura, Moneragala, Badulla, Kurunegala, Polonnaruwa, Ampara, Kandy, Matale, Udawalawe, Hambantota and Mahaweli Systems H, B, & C. These demonstrations were established with the collaboration of DOA and CAI Ltd. on irrigable lands, the objective being to demonstrate the profitability of growing maize in the upper tracts of paddy fields as part of a crop diversification scheme.

The results from 77 locations were analysed. The overall mean yields for the hybrid and open pollinated varieties were 6.01 and 5.47 tons/ha respectively. The yield increase of hybrid over open pollinated variety was 0.54 tons/ha (Abeysuriya, 1997). The yield increase due to the higher rate of fertilizer application was 0.59 tons/ha. Hybrid variety performed better than the open pollinated variety both under low and high levels of fertilizer, the increases amounting to 0.50 tons/ha and 0.58 tons/ha respectively.

Field days were held at the successful sites and around 4500 farmers were exposed to the new production technology.

Nutrena Ltd. had supplied seeds on credit to farmers in 200 ha in Bakamuna (Mahaweli System) in Yala 1996, and offered to buy the grain at Rs. 8/50 per Kg ex farm. A marketing advance of Rs. 350,000/- was also given to the Mahaweli Authority but the Authority failed to buy any grain. Nutrena Ltd. proposes to continue operating a similar program in Maha 96/97 on 500 ha making use of NGOs.

4.4 During the current Maha season (1996/97) further demonstration programs are under implementation (Charles, 1997). These are largely based on requests for AgEnt assistance by numerous clients exposed to the previous season's program. The Maha 96/97 program included the following:

1. Commercial production blocks - 10 ha each at Huruluwewa SCOR project. Seed and fertilizer costs were shared by AgEnt and the Farmers' Coop Societies. The cost was to be recovered at harvest and to be used as a revolving fund. Advanced Marketing International was to be the purchasing agency. Inadequate rains during planting and at the time of fertilizer application was reported.

2. One acre demonstrations in Dambulla (20-25). Loan guarantee up to Rs. 2000/- per acre from banks for seed and fertilizers were provided by Master Feeds. Seed and fertilizer costs were met by AgEnt through shared investment grants.

3. One acre demonstrations in Mahaweli System B. Cost of seed and fertilizer were met by AgEnt. The Mahaweli Economic Agency is to arrange cultivation loans to participating farmers through banks.

4. Nucleus farm (22.5 acres) owned by K.J. Holdings Ltd. AgEnt agreed to provide free seed and meet 50% of the cost of fertilizers.

5. Demonstrations on 50 sites in new areas in Sabaragamuwa and Southern provinces. AgEnt and CAI Ltd. shared costs of seeds and fertilizers.

6. Intercropping under coconuts - Mr. Pannilawithana (5 acres) and Mrs. S.A.C. Silva (20 acres) in Kurunegala district. AgEnt provided free seed and two third costs of fertilizer.

7. Nucleus farm (10 ac) and outgrowers (20 farmers) using 10 acres at Aththana Tenna Farm in Mahaweli System B. AgEnt met the cost of seeds and two thirds cost of fertilizers.

8. Group farming at Wellawaya (100 farmers cultivating 40 ac): AgEnt met the cost of seed and half the cost of fertilizer.

CAI Ltd had also supported 243 farmers in the establishment of pilot farms on 74 ha in Anuradhapura, Ampara and Moneragala districts in Maha 1996/97. (Lim Beng Joo, 1997) and sold 5 M.tons of hybrid seed. More farmers were willing to enter into contract but later opted out due to the drought.

4.5 Adverse weather conditions were reported in parts of Anuradhapura, Mahiyangana and Moneragala districts in Maha season. Failure of the rains during sowing time affected the plant density while inadequate moisture at flowering led to poor cob formation and depressed yields.

4.6 In order to assess the farmer response to the earlier demonstrations, field visits were made by the consultants to a number of villages where the demonstrations were conducted earlier. Interviews with several participating farmers in these locations revealed that they were convinced of the resulting benefits. As a result, most of them were continuing to use the recommended practices in Maha 1996/97 as well. In addition, it has also led to the establishment of larger block demonstrations (10 ha or more) in compact blocks at a few locations in Anuradhapura district with some support for inputs by AgEnt and millers. The farmers also stated that they would like to continue adoption of the new practices provided they have access to seeds and fertilizers in time and preferably on credit.

4.7 During rapid appraisal, farmers in other areas not exposed to the demonstration program revealed that most of them continue to grow maize using traditional methods - own maize seed, no fertilizers, low crop density and sometimes mixed with chilli, vegetables and legumes. Yields are low with the produce being mostly used for family consumption and any small surplus being sold to local traders. Those living near roads and markets sell part of the crop as green cobs. In Anuradhapura district, chilli forms the main cash crop and receives fertilizer application and even occasional pest control treatment. In Moneragala district, maize is the dominant crop with vegetable and legumes taking a subsidiary role. Obviously in these areas, maize farmers have not had much exposure to the improved technology and do not seem to aware of the opportunities for making more money.

4.8 In order to make a more systematic assessment of the impact in the form of spread of improved practices among maize farmers, a reporting format was sent to the districts and replies were received only from Moneragala district (provincial extension) and from Mahiyangana Project Manager (Badulla district). These are presented in Tables 13 and 14. The figures indicate that there has been an appreciable increase in extents under improved practices in Moneragala from 329 ha (Yala 1994 and Maha 1994/95) to 1471 ha (Yala 1996 and Maha 1996/97) and from 131 ha to 286 ha in Mahiyangana. The number of farmers adopting improved practices has increased from 389 to 1382 in Moneragala and from 325 to 821 in Mahiyangana over the same period. Admittedly, a great deal of extension effort would be required in order to reach the large majority of maize growers and convince them of the benefits. Nearly 75% of the maize farmers in Mahiyangana and 35% of the farmers in Moneragala fall into this category.

**4.9 Major issues in relation to sustained production:**

During this study, it was possible to identify some of the issues that are likely to affect increased production over large areas on a sustained basis. These are discussed further.

**1. Weak inputs delivery system**

Farmers need timely supplies of seeds and fertilizers. Most of the farmers exposed to the new technology wish to continue using good quality seed and fertilizer but they expect these to be provided on credit. The main source of credit is the local trader. Most farmer organisations are said to be reluctant to stock and sell seeds and fertilizer. Some of the millers, banks and NGOs have assisted to a limited extent but this is inadequate. Some of the farmers even stated that, though convinced, they have no option but to stop using fertilizer in future if credit facilities are not available. Serious attention has to be therefore paid to making inputs available to farmers using all possible sources of credit.

Table 13: Maize Production in Badulla District - Mahiyangana: Extents under improved practices[1/] and numbers of participating farmers.

| | Maha 1993/94 | | Yala 1994 | | Maha 1994/95 | | Yala 1995 | | Maha 1995/96 | | Yala 96 | | Maha 96/97 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Extent (ha) | No. of Farmers | Extent (ha | No. of Farmers | Extent (ha) | No. of Farmers | Extent (ha) | No. of Farmers | Extent (ha) | No. of Farmers | Extent (ha) | No. of Farmers | Extent (ha) | No. of Farmers |
| A.I. Mahiyangana | 30 | 62 | 11 | 35 | 38 | 110 | 14 | 35 | 60 | 210 | 16 | 42 | 80 | 225 |
| A.I. Nagadeepa | 24 | 40 | 27 | 36 | 28 | 46 | 35 | 92 | 34 | 76 | 70 | 200 | 70 | 210 |
| A.I. Kandaketiya | 17 | 41 | 17 | 43 | 20 | 55 | 21 | 53 | 21 | 50 | 25 | 72 | 25 | 72 |
| Total | 71 | 143 | 55 | 114 | 76 | 211 | 70 | 180 | 165 | 336 | 111 | 314 | 175 | 507 |
| Maize: Total extents cultivated and numbers of participating farmers | | | | | | | | | | | | | | |
| Mahiyangana | 385 | 760 | 11 | 35 | 390 | 762 | 16 | 40 | 365 | 723 | 18 | 50 | 242 | 580 |
| Nagadeepa | 490 | 920 | 27 | 36 | 500 | 932 | 35 | 92 | 500 | 939 | 87 | 230 | 45 | 1020 |
| Kandaketiya | 525 | 1100 | 20 | 48 | 600 | 1300 | 25 | 63 | 605 | 1300 | 40 | 116 | 204 | 508 |
| Total | 1400 | 2780 | 58 | 119 | 1490 | 2994 | 76 | 195 | 1480 | 2962 | 145 | 396 | 891 | 2108 |

Source: Agric Officer/Project Manager Mahiyangana

[1/] Improved practices refer to the use of recommended variety, fertilizer and spacing.

Table 14: Maize Production in Moneragala District: Extents under improved practices[1/] and numbers of participating farmers

| | Maha 93/94 | | Yala 94 | | Maha 94/95 | | Yala 95 | | Maha 95/96 | | Yala 96 | | Maha 96/97 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Extent (ha) | No. of Farmers | Extent (ha | No. of Farmers | Extent (ha) | No. of Farmers | Extent (ha) | No. of Farmers | Extent (ha) | No. of Farmers | Extent (ha) | No. of Farmers | Extent (ha) | No. of Farmers |
| A.I. Kotagama | 31 | 60 | 37 | 24 | 78 | 60 | 29 | 18 | 280 | 200 | 60 | 47 | 240 | 270 |
| A.I. Bibile | 18 | 40 | 10 | 38 | 110 | 95 | 20 | 23 | 340 | 360 | 75 | 98 | 330 | 290 |
| A.I. Madagama | 20 | 45 | - | - | 11 | 27 | 09 | 16 | 88 | 160 | 13 | 27 | 156 | 170 |
| A.I. Nanapurawa | 24 | 30 | 04 | 17 | 10 | 23 | 10 | 18 | 116 | 170 | 13 | 30 | 168 | 175 |
| A.I. Dabagalla | 23 | 51 | - | - | 28 | 45 | - | - | 68 | 136 | 16 | 15 | 66 | 80 |
| A.I. Mariarawa | 11 | 33 | - | - | 11 | 20 | - | - | 120 | 170 | 06 | 14 | 216 | 330 |
| A.I. Monaragala | 30 | 74 | - | - | 30 | 40 | 10 | 21 | 120 | 180 | 20 | 26 | 102 | 60 |
| Total | 157 | 333 | 51 | 79 | 278 | 310 | 78 | 96 | 1132 | 1376 | 193 | 257 | 1278 | 1125 |
| Maize: Total extents cultivated and numbers of participating farmers | | | | | | | | | | | | | | |
| A.I. Kotagama | 341 | 780 | 40 | 28 | 750 | 400 | 78 | 140 | 700 | 400 | 60 | 75 | 400 | 375 |
| A.I. Bibile | 200 | 160 | 10 | 42 | 950 | 480 | 110 | 210 | 850 | 460 | 75 | 90 | 550 | 390 |
| A.I. Madagama | 225 | 175 | - | - | 110 | 70 | 11 | 30 | 225 | 300 | 13 | 30 | 260 | 210 |
| A.I. Nanapurawa | 275 | 190 | 04 | 20 | 100 | 65 | 10 | 30 | 275 | 320 | 13 | 32 | 280 | 240 |
| A.I. Dabagalla | 170 | 160 | - | - | 280 | 80 | 28 | 42 | 176 | 286 | 06 | 10 | 110 | 75 |
| A.I. Mariarawa | 300 | 400 | - | - | 116 | 62 | 11 | 36 | 300 | 390 | 06 | 14 | 365 | 388 |
| A.I. Monaragala | 300 | 415 | - | - | 350 | 190 | 30 | 75 | 300 | 350 | 20 | 25 | 175 | 160 |
| Total | 1811 | 2280 | 54 | 90 | 2656 | 1347 | 278 | 537 | 2820 | 2530 | 193 | 277 | 2140 | 1838 |

Source: Assistant Director of Agriculture Moneragala (Provincial)

[1/] Improved practices refer to the use of recommended variety, fertilizer and spacing.

## 2. Supply of quality seeds

The tendency of most farmers is to save seed from one crop for use later. Being a cross pollinated crop, the quality deteriorates and there is a need to supply good quality seed regularly. Many of the millers interviewed stated that there is a shortage of good seed for this program, but the marketing of the seed that is available appears to be a serious problem.

Discussions with DOA Seeds and Planting Materials division officials indicated that the government farms now produce nearly 60,000 Kg of seed in Maha and 30,000 Kg in Yala. This seed is being sold at Rs. 25/- per Kg for registered seed and at Rs.20/- per Kg for certified seed at the sales centres (Pelvehera, MI, Hingurakgoda, Alutarama, Bata Ata and Rahangala). Agrarian Services Centres, interprovincial and provincial AD's offices and 700 registered seed dealers could buy stocks and sell locally if the demand exists but there is a reluctance to invest in seed retailing business as unsold stocks could lead to losses. Limited amounts of seed are also being produced and marketed by the private sector (Rajarata Farms, CIC, CARE Projects). Maize seed production and marketing are areas where the private sector could play a leading role. In contract farming schemes, the private seed industry should be encouraged to meet the seed requirements through its own dealer network (if farmer organisations are reluctant to stock and sell the seeds). The recommended seed rate for open pollinated varieties is 20 Kg/ha (8 Kg/ac).

## 3. Organising small farmers

Maize production is now in the hands of large numbers of small scale farmers, growing the crop on units ranging in size from 0.5 ac to 1 acre or even more, living in scattered areas. In order to utilise the benefit of economies of scale, group efforts are critical. Contract farming depends for its success on the formation of such groups for production and marketing purposes. Farmers

organisations, formed in terms of the Agrarian Services Act no. 58 of 1979 and the Amendment No. 4 of 1991 are ideally suited as one of their stated functions is "the marketing of produce and distribution of seeds, fertilizers and agrochemicals". The responsibilities of Farmer Organisations include:

1. Distribution of water
2. Decide crops to be grown
3. Maintenance of channel and distributory systems
4. Maintenance of roads, bridges and drainage system
5. Supply of inputs (seeds, fertilizer, agrochemicals etc.)
6. Organise Farmer Training Classes
7. Organise agricultural marketing
8. Facilitate grant of loans from banks

However, many of the maize farmers interviewed did not express a favourable opinion (as far as support to maize production is concerned) and intensive efforts will have to be made with the help of the Agrarian Services Department to activate as many of the Farmers' Organisations as possible to support the maize program and contract farming in particular. In areas where Farmer Organisations are not effective, DOA extension staff, NGOs and private sector companies with a vested interest in maize production could also organise farmer groups.

## 4. Contract Farming

Contract farming is not new to Sri Lanka. Outgrowers in Walapone (Nuwara Eliya District) and in Mahaweli System H have been supplying tobacco since the end of the 1970s. Sugarcane production on contract expanded in Moneragala district from 1986 as part of the government's efforts to increase self sufficiency in sugar. Export of vegetables came into prominence in the mid 1980s and gherkins were cultivated by no less than 15,000 households in small holdings under contract where the exporting firms provided inputs and services together with technical advice.

Some experience has been gathered from contract farming with maize during the last two years. CAI, Nutrena, Master Feeds, Gold Coin, Mandarin Farms, and AMI had supported pilot contract farming operations, supplying seeds and fertilizers and offers were made to purchase the produce at predetermined prices. The millers reported poor response at the end of Maha 1995/96 and the reasons attributed were the sale of the produce by farmers at higher prices to others as a result of low yields due to the drought and part of the crop being sold as green cobs. The smaller millers - New Bernards and Superfeeds - did not support contract farming as they considered the supply of inputs on credit to be risky and employing field staff as uneconomical.

Advanced Marketing International, a private sector marketing organisation proposes to introduce a new scheme to support contract farming from 1996/97 Maha. Interested farmer groups will be provided with seed and fertilizer at cost. Group leaders will be trained in group organisation methods and given incentives based on success of the production and quantities of produce sold to the company, which also intends to open field centres in Anuradhapura, Moneragala and Mahiyangana with field officers in charge. There are plenty of profitable opportunities for private sector - feed millers, traders, fertilizer companies and others to step in by selling inputs and buying produce.

In certain areas, private traders provide seeds and fertilizers on credit to local farmers and buy the grain at prevailing market prices. Farmers' views on contract farming indicated that they are strongly in favour and wanted seeds and fertilizer to be supplied on credit and the produce procured at the prevailing market price. Previous loan defaults were said to be due to the higher prices offered by local traders and absence of local representatives of the millers at the time of sale.

Sivarajah (1996) has described some of the contract farming experiences in Asia and Africa. In India, Hindustan Lever Ltd. operated a milk processing plant and obtained its milk requirements through contract production from

small dairy farmers. It also helped them to get involved in cash crop production and the net result was increased farm incomes. In Thailand, the Thai Silk Co. supported silk cocoon production under contract by small farmers. The firm developed infrastructure facilities including cocoon rearing houses for farmers on loan. A significant impact on incomes was recorded. In Kenya, sugarcane production under contract had benefitted the outgrowers while small holder tea production in other parts of Kenya had led to a neglect of maize and milk production.

Dunham (1995) discusses the achievements and weaknesses of contract farming in relation to gherkin production. Some of the observations have wider applicability. The difficulties of managing contractual arrangements with large numbers of small scale producers has been pointed out and that firms have to therefore accept some element of default or non payment of loans as a cost of out grower production. A producers commitment to the contracting firm is to some extent a function of the availability of alternative outlets and of relative prices.

Some suggestions have been made on how contracting firms could reduce their risks. These are:

i. They can locate collecting centres in remote villages where the competition from local traders is less <u>or</u> use mobile purchasing arrangements.
ii. They can work through local agents to cut down transaction costs, to organise collection and to monitor outgrower activities.
iii. Drop those who deliberately default for the next year.
iv. Buy the grain at prevailing market prices (similar to the prices offered by the local traders).

## 5. Spread of the Technology

Reaching and convincing large numbers of small scale maize growers living in scattered locations is not an easy task. The extension service has problems of inadequate numbers and insufficient funds for travelling. As seen in Tables 13 and 14, only around 20-25% of the maize growers in Mahiyangana adopt the new practices, while in Moneragala it is around 65%. Large numbers are still not exposed to the new technology. Unless large numbers of production kits are distributed and backed by intensive farmer training activities, the spread of technology is bound to be slow. Hence a modified approach may have to be considered. It is more appropriate to concentrate on the high potential areas first and use simplified demonstration mini kits. Within a district, there are recognisable differences in soil conditions, land form and rainfall patterns. These factors combined with farm to market roads, access to markets, active farmer organisations and local leadership could be used as suitable criteria for demarcating high potential areas by the extension service. Such areas could have demonstration mini kits with Ruwan or hybrid seeds and one level of fertilizers. A video film showing the new technology and local farmers' experience (success stories) could be used in support of farmer education. When questioned about hybrid varieties, most farmers spoke of the higher yields but during this Maha season, yield differences were not adequate to meet the higher costs of seed (owing to the adverse weather conditions). Hybrid variety is preferred in areas where supplementary irrigation is available or where soil moisture is not a limiting factor.

## 6. Monitoring System

Statistics on cropped extents and estimated production of maize are available in the district offices. The reliability of these figures has been questioned by some of the millers. Reliability of these figures should be improved. As stated previously, statistics on the adoption of improved technology were called from the districts but the response was poor. To assess the impact,

information should be gathered seasonally on extents under improved technology, (variety, fertilizer and spacing) number of farmers involved, quantity of seeds and fertilizer distributed, average yields, and on contract farming. With the support of Census and Statistics Department, a methodology for verification of farm sizes and yield estimation on a random sample basis should be devised.

## 7. Marketing System

Most producers sell the produce soon after harvest to local traders. They have built up a "relationship" over the years to the benefit of both parties. Some traders even provide fertilizers on credit and recover cost at harvest. Wherever there is more than one trader in a town, producers have the choice of selling at the higher price due to the competition. The farmers interviewed stated that the current price of Rs. 10/- per Kg was favourable and that the entry of Advanced Marketing International was one of the reasons for the higher purchase price. Supporting such private marketing organisations in maize growing districts would help in creating more competition in the market and in farmers getting higher prices.

Some concern has been expressed by millers about the poor quality of the local maize due to its aflatoxin content. This could be minimised by drying the grain well soon after harvest, and by rejecting bird damaged and mouldy grain. This problem is likely to increase in magnitude as local production goes up and farmer education should deal with post-harvest practices and the production of high quality grain.

In order to meet the increasing demand for seed and to overcome the reluctance of farmer organisations in some areas to stock and sell seed, the private sector should be supported to produce more seed locally and to import suitable highyeilding hybrid seed and to sell it through their dealers/agents, especially in contract farming schemes.

# CHAPTER V
# CONCLUSIONS AND RECOMMENDATIONS

## 5.1 Demand for Maize and Production Potentials

Maize, for long considered an inferior coarse cereal, has in recent years assumed importance as an important constituent of livestock feed. Given income elasticities of the order of 1.5 or more for livestock products, the indirect demand for maize as livestock feed could grow at rates of growth of 5 percent or more per annum over the next five to ten years and more. This will be in line with the experiences of the developed countries and the newly industrialized countries at similar stages of development.

Currently, the country imports more than 50 percent of its requirements, primarily to meet the needs of the feed industry. This is in contrast to a situation of near self-sufficiency not too long ago. Maize production is characterised by backward technology and poor management techniques. As indicated in the sections that follow, an improved technology is available but rapid adoption is constrained by numerous factors. An analysis of the economics of maize production as well as that of competing crops suggest that the potential exists for rapid increases in extents and yields. Farm earnings from maize are comparable to those of other crops, except for chillies. It has the added advantage of making less demands on labour and capital. But maize has to compete with other crops for the use of land and labour, as well as with imports in an era of an open economy and globalization.

Price projections developed by the World Bank suggest declining real and nominal prices. The domestic sector will have to gear itself in terms of both quantity and quality to meet with increased competition from other field crops as well as imports. This calls for continued investments in research as well as improvements in the input delivery system, output marketing and farm level institutional organisations.

The traditional marketing arrangements appear to be able to handle current levels of production reasonably well. At the farmer level, the boutique keeper/mudalali is able to provide the needed services, including the provision of credit, both for consumption and production. Farmers who were contacted in the course of the rapid rural appraisal did not complain of exploitation, but felt a better price could have been received, given a framework of institutional credit. Years of experience with the promotion of institutionalised credit in this country gives little hope of any rapid breakthroughs. It took Sri Lanka more than 30 years to increase its self sufficiency ratio in paddy production from about 80 percent to about 10-15 percent. This is indicative of the magnitude of the problem facing those responsible for bringing about the necessary changes in the maize production and utilization environment.

A critical analysis of the production and marketing environment is hampered by the lack of reliable data. A lacunae in the efforts to promote maize production is the failure to collect input-output data on a sustained basis. An economist should have been associated in the promotional programme right from its inception and the assistance of a sociologist would have been helpful.

## 5.2 Input Delivery System

The Production/Trial kit program has clearly demonstrated that the use of maize varieties with high yield potential combined with a plant density of around 55000 plants per hectare, fertilizers and weed control could easily double the present average yields if weather conditions remain favourable. The yields obtained by farmers range from 1100 to 1400 Kg/ha under traditional methods of cultivation. In order to sustain high yields the timely supply of seeds and fertilizer is critical and these should preferably be made available on credit. Local traders, banks, millers and NGOs provide a small amount of credit but this is inadequate. To overcome this input supply and credit problem, the Farmers Organisations and Cooperatives should be activated and persuaded to perform the input supply and produce marketing functions, particularly to back-up the contract farming schemes.

It is recommended that, since the Farmer Organisations are supervised by the Department of Agrarian Services, a senior officer from that Department be invited to serve as a member of the collaborating team. His/her involvement at all stages of planning, execution and monitoring of the contract farming program should bring about a greater commitment of the Farmer Organisations to the maize production effort.

## 5.3 Organising Small Scale Farmers into Groups where the Farmer Organisations are ineffective.

In areas where Farmer Organisations or cooperatives are ineffective and maize growers are interested in commercial production, organising them into informal groups would be advantageous for input supplies, recommending bank loans and for marketing of produce.

To facilitate the organisation of such informal groups, it is recommended that the initiative be taken by the extension service. Leaders should be identified and trained in organising input supplies and in marketing. These activities should be monitored.

## 5.4 Contract Farming

The feed industry should play a leading role in promoting maize production. The contract farming schemes operated by millers and producers during the past two years have been on a very limited scale. Nevertheless, experience has shown that the success depends mostly on timely supplies of seeds and fertilizers preferably on credit, buying the produce at prevailing market price with a guaranteed minimum price and maintaining contact during the growing season. There are plenty of profitable opportunities for the private sector - feed millers, traders, fertilizer companies and others to step in through input sales and marketing of produce.

To support the development of contract farming, it is recommended that in high potential areas, initially small scale contract farming schemes (group/block demonstrations) be jointly planned and implemented by the Farmer Organisations/Cooperatives/ informal groups and millers. The extension staff and DAS representatives would serve as the facilitators. The Farmer Organisations will be responsible for distribution of inputs, recommending credit, persuading members to sell the produce to the millers concerned and to keep records. A revolving credit fund should be created to support the Farmer Organisations in the supply of inputs to farmers on credit.

As a further measure of support for contract farming, it is recommended that the DAS or DOA operates a marketing extension service. The function of this marketing service would be to advise Farmer Organisations/Coops/Farmer groups in improved marketing, train extension staff, Farmer Organisation representatives, and local dealers in marketing and provide regular information on prices.

Since adverse weather conditions could result in losses, it is recommended that a crop insurance scheme for maize be formulated by government and put into operation on a pilot basis in high potential areas.

## 5.5 Spread of Technology

With the present limitations on the numbers of extension personnel having to cover large areas and focus on several crops, it is difficult to expect a rapid spread of technology. Not all areas have the same potential either.

It is therefore recommended that the extension service identify the high potential areas for maize, soya, sunflower in each district and concentrate the efforts in these areas initially. It is also recommended that a simplified demonstration mini kit with one variety and one level of fertilizers be distributed to farmers through Farmer Organisations/Cooperatives/informal groups in areas not previously exposed to such technology. Local seed and fertilizer dealers, bank representatives, local

administrators, provincial council representatives, NGOs, Samurdi Niyamakayas and local leaders should also be involved in the spread of technology. A film showing the cultivation practices and local farmers' experiences could be produced and used in support of farmer education. Rather than centrally producing these demonstration mini kits, it is suggested that the DOA Task Force (OFC) allocates sufficient funds from Central Government votes to the provincial Assistant Directors for this purpose, as well as additional funds for travelling by field extension staff and for local printing of handbills and other publicity material.

The establishment of nucleus farms by millers would also facilitate the spread of technology among other farmers in the locality. The import of seeds of promising varieties by the private sector should be encouraged for trials and for commercial use.

## 5.6 Monitoring System

The present set of statistics on maize production and extents is very approximate. There are no proper statistics to show the adoption of improved practices and the resultant benefits. A monitoring system that would reflect the impact of the program is vital.

It is therefore recommended that the support of the Department of Census and Statistics by sought to devise a methodology for ascertaining the extents under maize, and yields district wise in a more reliable manner. It is further recommended that the Farmer Organisations/Cooperatives/informal groups be trained in keeping records of inputs distributed, credit channelled, and grain purchased under the contract farming scheme. Millers should also supply figures of local procurement of maize. The district level statistics should show the rates of adoption of improved technology, yields obtained, costs of cultivation and results of contract farming. Based on this information, a simplified Newsletter showing progress made seasonally, could be published by the Task Force (OFC) for distribution to all parties concerned, including the provincial councils.

## 5.7 Establishment of Large Farms

A few of the feed millers have expressed their interest in opening large farms for maize production if suitable land with irrigation facilities is made available and incentives given for import of machinery and inputs. If successful, such nucleus farms could in addition provide advisory services and inputs to outgrowers and procure the produce. There is also the prospect of introducing other crops such as soya, sorghum and sunflower in these farms and in further development of processing industries for oil extraction and production of defatted meal by the private sector.

It is therefore recommended that suitable land with irrigation facilities be released on lease for large scale crop production to private entrepreneurs under stipulated conditions. It is also recommended that incentives usually given for BOI projects for imports of farm machinery and inputs be given to such entrepreneurs as well.

## 5.8 Collaborating Agencies and their Suggested Roles

With AgEnt initiative, the collaboration between the private and public sectors has been strengthened with a view to improving the animal feed industry in Sri Lanka. As a result of this collaboration, the technology developed by the Department of Agriculture is now being utilised by some of the maize growers to obtain substantially higher yields and they have the assurance of being able to sell the produce at the market price. When this collaborative program started in Maha 1995/96, the main collaborators were AgEnt, DOA and one of the millers (CGE/CAI). Judging from published reports, field visits and interviews with some of the participating farmers, the results have been encouraging mainly in the area of technology demonstration. The initial phase was focused on demonstration of the improved technology and its spread among growers.

As the maize program moves into the next phase of commercial production, a higher level of effort would be required. There is a need to clearly identify the tasks to be performed and the roles of the involved agencies, particularly with a view to ensuring

sustainability in production. This study has indicated some of the factors most crucial to ensure sustainability in production. These are:

i. Small scale farmers have to be organised into groups.

ii. Farmers should have access to seeds of both local highyeilding varieties and imported hybrids and fertilizers in time, and preferably on credit terms.

iii. Farmers should be aware of a minimum price for the produce early in the season, with assurance of buying the produce at harvest at the prevailing market price.

iv. Technical advice on the use of the new technology should be provided by DOA or the private sector (nucleus farms).

With these in focus, the following suggestions are made on the desired roles and functions of the collaborating agencies.

**Feed Millers**

1. The feed milling industry should take the lead in promoting maize production. They should enter into agreements with Farmer Organisations/Co-operatives/informal farmer groups for maize production on contract.

2. Support such contract farming activities by arranging supplies of quality seeds and fertilizers preferably on credit to farmers. Import seeds of improved varieties for trials and for commercial cultivation.

3. Offer a guaranteed minimum price for the produce with assurance of being paid the prevailing market price.

4. Maintain close contact with the growers during the season using own staff or local representatives and monitor progress.

5. Assist Farmer Organisations to buy the produce.

6. Provide rewards to those Farmer Organisations/Co-operatives/Farmer groups for keeping the contracts.

7. Support the establishment of Block Demonstrations, an initial phase of contract farming, by sharing the cost of inputs with the Farmer Organisation.

8. Develop nucleus farms where land is available for production of maize, soya, sunflower etc. Support outgrowers and buy back the produce.

9. Furnish information on local maize procurement seasonally.

**DOA**

1. Provide active support to agroindustry in developing an outgrower production programme. Identify high potential areas suitable for contract farming. Recommend suitable land to private entrepreneurs for opening nucleus farms.

2. In areas where Farmer Organisations/Co-operatives are functioning, organise meetings jointly with DAS official and millers, and explain the contract farming scheme to growers and the economic benefits. Invite seed, fertilizer dealers, bank officials and others concerned who could support this scheme. Encourage their participation in contract farming.

3. In areas where Farmer Organisations/Co-operatives are not functioning, organise informal groups jointly with millers and NGOs using interested farmers and local leaders and encourage them to participate in contract farming.

4. Assist in obtaining timely supplies of seed and fertilizer and resolve issues on imported seed.

5. Continue to provide technical guidance to the farmers.

6. Monitor progress on extents, total production, average yields, adoption rates, and incomes obtained. Train Farmer Organisation/Group Leaders in maintaining records. Train selected farmers in keeping reliable cost of production records.

7. Support private seed industry in seed production techniques.

8. Strengthen linkages between producers and marketing organisations with a view to helping producers get the maximum price for the produce.

9. Share the cost of production mini kits.

10. Continue on-farm trials to determine the most profitable set of practices under local conditions. Refine the present set of recommendations to be more location specific.

11. Task Force (OFC) should allocate some funds to the provincial extension services for expenses on contract farming (additional travelling for field staff, local printing etc.). Publish a Newsletter seasonally showing progress achieved in maize production and in contract farming. Organise annual meetings of millers and public sector officials to review progress, identify problems and suggest measures to overcome these.

**DAS**

1. Provide active support to agro industry in developing an outgrower production program. Identify Farmer Organisations with potential and promote participation in contract farming. Jointly with DOA officials, organise meetings of farmers and explain economic benefits.

2. Support Farmer Organisations in obtaining seeds and fertilizers in time and in channelling credit to eligible members, particularly in high potential areas in each district.

3. Provide training in marketing to the committee and supply market information (prices etc.) to members.

4. Support the Farmer Organisations in collection, storage and transport of grain and in recovery of credit.

**AgEnt**

1. Continue to coordinate the functions of millers, marketing organisations, and public sector agencies with focus on commercial production.

2. Support the development of contract farming by sharing the cost of inputs for block demonstrations. The cost of such seed and fertilizers would be recovered at harvest and used as a Revolving Fund for future loans.

3. Support the training, by cost sharing, of Farmer Organisations/Co-operatives/Farmer Group leaders, and marketing organisation representatives in efficient marketing.

4. Procure and supply suitable medium scale maize shellers to selected Farmer Organisations on a cost sharing basis for hire to members.

5. Import and supply seeds of new varieties of maize, soya, sorghum, sunflower to DOA for local testing and possible introduction.

6. Support private industry in the processing of soya and sunflower for oil and meal.

7. Influence government to allocate suitable land to private entrepreneurs/millers for commercial production of maize, soya, sunflower and to provide duty concessions for import of machinery and other inputs as in BOI approved projects.

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