A REVIEW OF AGRICULTURAL RESEARCH AT MAHA-ILLUPPALLAMA

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ABSTRACT

This paper traces the progress of agricultural research at Maha Illuppallama, beginning with its inception as a dry farming station to determine the basic concepts and practical application for replacing the prevalent shifting and subsistence highland agriculture practised on the unirrigable uplands of the dry zone with a more profitable and stabilized system, through the development of improved rice cultivars and rice based cropping systems to increase the cropping intensity of the poorly irrigated ricelands in the valleys, to land, water and crop management studies suitable for implementation in the irrigated highlands of the Mahaweli Diversion Programme.

INTRODUCTION

Maha Illuppallama is situated in the typical dry zone, where the rainfall is bimodal with an average precipitation of 930 mm from mid September to January (Maha season) and 380 mm from March to May (Yala season). June to mid September are relatively dry months. This unusual rainfall pattern, combined with the fact that underground supplies of water are generally absent, brought into play a two-fold system of agriculture, which has been in operation for over 2000 years. The irrigable valleys are planted with rice, while the unirrigable uplands are grown with other food cops in shifting forest fallows (chena). Minor cereals, grain legumes, chilli, mustard and vegetables are cultivated during the rainy season; sesame is grown in the relatively dry yala season.

It is estimated that of a balance 1.3 million hectares of cultivable land in the dry zone, even after the full realisation of the irrigation potential, one million hectares will still remain unirrigable. Ways and means had therefore to be found to replace the current shifting system of subsistence agriculture with a permanent and profitable form of farming to meet the dietary standards of a rapidly increasing population, and to provide savings in an increasingly heavy food import bill.

PRELIMINARY ATTEMPTS

Preliminary attempts to stabilize highland agriculture were started at Maha Illuppallama in 1903, with the objective of determining what economic crops could be cultivated under purely rainfed conditions. Cotton, sisal, tobacco and groundnuts were some of the crops tested, but as these trials were unsuccessful, the station was subsequently closed down in 1919.

This initial attempt was followed by small scale experiments in 1926 at Vavuniya, Anuradhapura and Tissa. The encouraging results obtained from these experiments sparked off the creation of a large scale dry farming scheme at Kurundankulama in 1938. The original 40 ha scheme was expanded to 400 ha in 1949, and three more schemes on a smaller scale were started at Relapanawa, Olukaranda and Makalanagama about the same time (Karunaratne 1956). It became apparent however that the settlers in this scheme were unable to sustain a prolonged program of permanent farming.

Consequently, a fully equipped research station was reopened at Maha Illuppallama in 1950 (backed by a generous grant from the New Zealand Government under the Colombo Plan Technical Assistance Scheme) to probe the failure of these dry farming schemes and to determine alternative solutions.

BASIC CONCEPTS

Subsequent land classification and utilization studies done at Maha Illuppallama indicated that the failure of the dry farming schemes was due largely to the fact that the uplands had been apportioned into relatively uniform allotments averaging 5–6 ha, on the assumption that they all possessed similar characteristics. This was a mistake. The uplands were comprised of two district land classes which had to be treated differently. These were the well drained upper slopes where most arable crops could be cultivated successfully during the Maha season. In the imperfectly drained lower slopes however these crops either failed or performed poorly owing to high profile saturation. Dry paddy and/or pasture and fodder grasses were found to be more suitable for this land class.

Experimental evidence further indicated that soil fertility was quickly depleted under continuous cultivation on the uplands, and that the addition of fertilizer did not give substantial crop returns unless it was combined with organic manures such as cattle dung or compost. (Abeyratne and Panabokke, 1953). Inclusion of a pasture and fodder component in the upland cropping system was therefore important for two reasons: (1) to provide the base for a developed dairy industry which would supply the necessary organic matter to a stabilized farming system deprived of the natural fertility regeneration of the forest fallow, and (2) to provide a supplementary income to farmers during the dry period when the prospects of arable cropping are poor. The introduction and management of tropical grass species and their legume associations thus became an essential ingredient of this farming system (Fernando 1958 and 1961).

CROP IMPROVEMENT

Once the basic cropping concepts had been determined (Abeyratne,1956), the next step was to improve the degenerated crops that were originally cultivated in forest fallows. Notable successes have been the MI 1 and MI 2

dry chilli, T 48 and Bhadra maize, MI 1, MI 2, Type 51, MI 4, MI 5, and Selection 77 mungbean, Arlington and MI 35 cowpea, MI 1 and Type 9 blackgram, Uganda Erect, Red Spanish, A 90, A 92 and MI 1 groundnut.

As attempt was also made to develop an acceptable dhal cultivar, which would provide all the year round protein. Early introductions of Turdhal, although deep rooted and drought resistant, were too tall to facilitate easy harvesting, and also very susceptible to pod borers. A subsequently developed dwarf strain (MI 10). while eliminating the problem of harvesting, was still considered to be uneconomic because of its great susceptibility to pod borers. Although suitable pesticides were available to control these pests, the cost factor was too high. Further investigations have identified two introductions, Upas 120 and T 21, of intermediate height, which can be cultivated successfully with minimal pest control.

New agro-industrial crops were also introduced successfully for the first time, particularly castor, sunflower, lemon grass and soybean. (Fernando and Fernando, 1967). A remarkable break through was achieved in the cultivation of soybean (Fenando, Vadieval and Jayapathy, 1980), which has subsequently acquired a popular status in the cropping patterns of the dry zone farmer.

PRACTICAL APPLICATION

Practical application of the basic concepts of dry farming developed at Maha Illuppallama (Abeyratne, 1956) were put to the test in farmers' fields for the first time in the Yoda Ela Dry Farming Project in 1975. 17 farmer families were settled in 2 ha allotments each of typical dry zone upland. Under the guidance of Research Officers from Maha Illuppallama they were introduced to a mixed farming system. where "dairying" and the cultivation of semi-perennials like castor and papaw were included in addition to the cultivation of seasonal crops. Farmers were permitted to use the minimum tillage operations they were accustomed to in the chenas. Cattle were fed mainly on grass and minimum concentrates. Assured markets were provided (Fernando, Senanayake and Sivapathan, 1980).

Although the results of this project indicated that such a mixed farming system was a feasible proposition, the maintenance of soil fertility and weed control continue to loom large specially in the recent context of widespread inflation which has escalated the cost of fertilizers and chemical herbicides. Consequently, new organic farming methods eg. no-till, live bush mulches and alley cropping are now being tested to offset these disadvantages.

RICE RESEARCH

Although the emphasis at Maha Illuppallama was on dry farming, rice research received its due share of attention. The first rice hybridization program was initiated at this station, and two important cultivars were released for general cultivation: Murungakayan 302, the first improved variety to show a distinct response to fertilizer application, and MI 273 (m) the first high-yielding mutant. Subsequently, after the rice hybridization program for wet rice was removed to Batalagoda, rice research at Maha Illuppallama was restricted to developing improved cultivars of dry rice (Dikwee 329, MI 329 and Pinulot) and semi-dry rice for the purely rainfed and poorly irrigated regions of the dry zone, (Ganashan, 1980), and increasing the cropping intensity of ricelands in the minor irrigation schemes.

It was observed that despite rapid advances in rice breeding and management, rice production in the minor irrigation schemes remained at a very low level of development. Farmers had the habit of leaving their fields fallow during the dry yala season. Even in the rainy Maha season it was not often that they were able to take a successful harvest. On investigation it was found that this situation was by and large the outcome of unbalanced water management. Farmers were inclined to wait until the small reservoirs were full or partly full towards the end of November or early December before they commenced cultivation. As a result they failed to utilize the incidental rainfall between late September and November, thus putting unnecessarily great pressure on reservoir storage. Inevitably the water in the reservoirs was completely used up in the Maha season, leaving little or nothing for taking a second crop in the following dry period. And very often the water in the small reservoirs was inadequate even to mature a Maha crop.

Consequently, a Cropping Systems Project was initiated in 1975/76 at Walagamgahuwa—a typical minor reservoir village settlement–with aid of the IDRC and IRRI, to devise a more efficient cropping pattern and water management system. Farmers were advised to sow their rice crop early with the first rains which fell in September/October, and to thereby preserve reservoir storage for irrigation in late Maha when the rains began to tail off, and also to enable them to take a follow-crop later. To make doubly sure that maximum water conservation would be achieved, farmers were also persuaded to use short-aged cultivars of 3–31/2 months duration instead of the 4–41/2 months varieties they were accustomed to grow.

The results over 5 years have been encouraging. Except for the first year when the necessary adjustments were being made, farmers at Walagambahuwa have been able to take two successful rice crops a year. Even in the

first year other food crops (requiring less water than rice) were cultivated in the second season instead of rice (Upasena, Sikurajapathy and Seneviratne, 1980). This improved cropping system has subsequently been introduced to about 700 minor reservoirs settlement schemes in the Anuradhapura and Kurunegala districts. It is still too early to comment on its impact, since the change has brought in its wake problems of dry–tilling and sowing and attendant rampant weed growth which farmers find hard to tackle. Research at Walagambahuwa is now directed to finding ways and means to alleviate these problems. Rice breeding at Maha Illuppallama is also aimed at developing more suitable cultivars of short age and early seedling vigour to fit into such a cropping system.

IRRIGATED FARMING

The advent of the Mahaweli Diversion Project in the 1970s saw Maha Illuppallama take on the added responsibility of determining suitable land, water and crop management systems for the hitherto unirrigable highlands of the dry zone.

On-station research was directed to determine crop-water requirements, irrigation frequencies, infiltration rates, profile saturation and crop tolerance to profile saturation. Sprinkler designs, open channel and furrow systems of irrigation, and suction irrigation methods were tested on graded terraces and flat basins, with attendant surface drainage. (Lewis 1980, Rasiah 1980).

Two pilot projects were also started at Maha Illuppallama and Pelwehera, in 1970 and 1971 with practising farmers to study the optimum size of family holding and suitable farm layout and cropping patterns.

These studies have contributed in no small measure to the settlement and development of System H, the first of the irrigation systems to be completed under the Mahaweli Diversion Programme. (Research Report, Department of Agriculture, 1981).

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