

The Role of Millets in Increasing the Food Production in Madras

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Introduction. Millets are a group of small grained cereals which are found to thrive in areas of low rainfall. They are food crops which are complementary to paddy and between paddy and millets, the people and the cattle of this province are fed.

There are eight individual crops under the collective name of millets in Madras. They are, *Cholam*, *Cumbu*, *Ragi* and *Tenai* which are the more important millets and there are four more millets which are of lesser importance, that is *Varagu*, *Samai*, *Panivaragu* and *Kuthiravali*.

Area. In the Madras Presidency, the millets occupy a total area of 12.7 million acres. Out of this area 4.8 millions are occupied by *Cholam*, 2.6 millions by *Cumbu*, 1.8 by *Ragi* and 1.5 by *Korra*. The remaining 2 million acres are occupied by the 4 minor millets mentioned above.

Distribution. Millets are grown, mostly as dry crops, in practically all the districts of the province, except in the very high rainfall districts of Nilgiris, Malabar and South Kanara where they are not of much importance. The distribution of the various millets in the several districts of the province, presents certain interesting features. *Cholam* is an important crop in the Ceded Districts, Coimbatore, Guntur, Nellore, Madura, Salem, Tiruchirappalli and Kistna. *Cumbu* is an important crop in the districts of Coimbatore, Salem, Trichinopoly, Vizagapatam, Guntur, Tinnevely and Anantapur. *Ragi* is important, in the districts of Salem, Vizagapatam, Coimbatore and Chittoor. *Tenai* or *Korra* is important in the Ceded Districts and Guntur. The order of districts enumerated under each crop is in their descending order of their importance. It will be seen that each millet appears to prefer certain areas to others and there is a difference in the preference shown by the different millets with regard to their distribution in the presidency. These preferences are directly related to the distribution of the rainfall in the province. The rainfall varies from 20" to 50" excluding the three very heavy rainfall districts mentioned above. Grouping the districts into three rainfall zones of (1) less than 30" of annual rainfall, (2) between 30" and 40" of rainfall, and (3) between 40" and 50" and relating the same with the distribution of the the various millets, the following interesting features have been brought out: *Cholam* grows mostly in the lowest rainfall area, and its area comes

down steadily as the higher rainfall zone is reached. Within this range there are, of course, different physiological types of *Cholam* which make them fit to the environment in which they grow. The millet *Cumbu*, has a major area, in the second rainfall group i. e., 30" to 40" rainfall. It has sufficient adaptability to make it stand much less rain, and also much more rain. *Ragi* is somewhat like *Cumbu*. The millet *Tennai*, has a peculiar distribution. Nearly 85% of its area is in the lowest rainfall zone. The area comes down steeply, as the rainfall increases. As the third rainfall group is reached going upto 50" of rainfall, the millets in general become scarce.

Special features of Millets. Millets are dry crops, that is, crops mostly grown in dry lands. Ninety percent of *Cholam* area and 87% of *Cumbu* area, is rainfed. In the case of *Ragi* 47% of area is rainfed. Millets however, respond very well to manure and irrigation. Under good management, the irrigated yields of millets are 3 to 4 times those of dry lands. Millets grow even on the poorest soils.

The food value of millets is intermediate between wheat and rice. *Cumbu* is particularly good food, rich in protein and fat. The fodder of millets is superior to that of paddy. The straw of *Cholam* is more valuable than the rest.

Millets are highly local in their behaviour. They are conservative and less cosmopolitan than the other crops. They are more susceptible to the conditions of the soil and climate. This increases the difficulty with regard to their improvement by breeding. A strain evolved, in a particular place has a possibility of only a limited spread. There are several local varieties of millets in each tract and sub-tract, which have adapted themselves to the environment. The variety of one tract does not suit another tract. It has therefore been found necessary to open regional stations to deal with each of these main tracts.

Methods of increasing Millet Production. It is well known that the quantity of millets and paddy produced in the province, is not sufficient to meet the requirements of the province, and large imports are being made to maintain sufficient supply. The population of our province is now in the neighbourhood of 50 millions. The food requirement of this population per annum is about 8.15 million tons. The food production in the province, for example in 1946—47, has been 4.40 million tons of rice and 2.56 million tons of millets making a total of 6.96 million tons. This leaves a deficit of 1.19 million tons which is about 12% of our total production. The deficit is not very much and appears to be within our power of making good. The well known methods of increasing the production of crops are (1) Extension of existing area, (2) Improved

cultivation including land development, (3) Manuring and irrigation, and (4) The use of improved strain seeds. With regard to the extension of the existing area though there are 11 million acres of cultivable waste land, it was seen that much of this land was marginal land, not quite fit for cultivation and unremunerative. The scope of increasing millet production by this method, deserves further examination. Improved cultivation, including land development, aids in producing larger crops and there are several schemes under the consideration of the Government. So is the case with regard to irrigation. The problem of manuring deserves special attention. Millets are mostly grown in dry lands. Though dry lands occupy 75% of the total cultivated area of the province, very little of dry land is manured. This is due to lack of manure, as available manure is mostly diverted to irrigated and wet lands. The application of manure to dry lands that are situated in low rainfall areas, does not result in proportionate increased yield, because owing to lack of rainfall, the manure does not become wholly available to the plants. The problem of manuring dry lands deserves further study, and increasing the production from dry lands by intensive manuring is somewhat remote at the present stage.

A sure way of increasing the yields of crops in dry lands is by the use of seed of improved strains. They do not involve additional cost to the cultivator. Improved strains are improved machines, that are able to turn out more from the available material by greater efficiency in metabolism.

The study of millets is one of the latest additions to the plant breeding side of the agricultural science of the province. Cotton, sugarcane, paddy and other world crops have received attention from a very long time dating back to the previous century. The work on millets started in the year 1922. The millets are now being studied intensively. The knowledge obtained from these studies is being utilised in the evolution of high yielding strains.

Achievements. During the course of study on millets it soon became evident that strains suitable to large areas in the province could not be evolved by working only at the Central Millet Station at Coimbatore. Work on a regional basis was therefore undertaken by strengthening the staff at the Regional Agricultural Research Stations, Anakapalle, Guntur, Nandyal, Hagari, Palur and Koilpatti by the addition of Staff, trained in Millet Breeding. As a result of the combined work the following high yielding strains have been evolved. In *Cholam* 24 strains have been released, 11 from the Coimbatore Station, 2 from the Anakapalle Station, 4 from Guntur, 5 from Nandyal, 1 from Hagari and 1 from Koilpatti. They represent the parental varieties of *Periamanjil*,

Talaivirichan, irrigated *Senchulam*, *Chitrai vellai cholam* and *Chinnamanjal cholam* of Coimbatore, the *Patcha jonna* and *Tella jonna* of Vizagapatam, the *Mudda jonna* and *Gidda jonna* of Guntur, the *Cheruku patcha jonna* and *Gundu patcha jonna* of Kurnool, the *Tella jonna* of Bellary and the *Irungu cholam* of Koilpatti.

In *Cumbu* 8 strains have been released, 3 from Coimbatore, 3 from Anakapalle and 2 from Koilpatti, representing the parental varieties of *Kottapuli cumbu* of Coimbatore, the *Pedda ganti* of Vizagapatam and certain African varieties. In *Ragi* 12 strains have been released, 4 from Coimbatore and 7 from out stations, representing the varieties *Gidda aryam* of Salem, *Burada chodi* and *Pairu chodi* of Vizagapatam, and a genetic mutant at Hagari. In *tenai* 7 strains have been released, 3 from Coimbatore and 4 from out stations, representing the varieties *Mosu tenai*, *Sadai tenai* and *Perum tenai* of Coimbatore, *Punasa korra* and *Sena korra* of the Guntur and Ceded Districts. The total number of strains so far released in all the millets put together is 51. A detailed statement is enclosed.

Work that remains to be done. The consolidation of the gains from plant breeding work on millets has now been taken on hand. So far the strains have been tried as isolated items of district work, to appreciate their worth in the regions to which they belong. It was found on the average, that the strains have yielded about 10% more than the local varieties calculated on a conservative basis. It is now proposed to consolidate this gain by spreading it out on as large an area as possible. This is now being done as a specific item of work in the Grow More Food Campaign. Target areas have been fixed for each district and by sustained effort it is expected that the targets would be reached in the course of 4 or 5 years. It is seen from the figures that have been worked out, that an increased Millet Production amounting to about 3 lakhs of tons at the end of 1952—53 would be achieved, the value of which is nearly 6 crores of rupees.

As has already been explained, millets are very local in their disposition. For example a *cholam* strain evolved at Nandyal in the Kurnool District could not spread throughout the district because the district contained late black soils and early red soils and a strain bred for the one type was not good for the other. This shows the necessity for working at more centres than one in a district, if the full benefit of the plant breeding work is to be derived. In addition to this, there are certain large areas in the presidency for which work has yet to be taken up. In this connection regional millet breeding stations have already been proposed to be established for the tracts of Narsipatam and Ongole in the Circars and Ariyalur and Periakulam in the South. These proposals are under the consideration of the Government.

In *Cumbu* a new technique is being adapted to evolve high yielding plants. It is well known that hybrids are more vigorous than pure bred plants generally. In maize the hybrid vigour has been utilised on a commercial scale by breeding high yielding hybrids. The work is easy in maize because hybridisation on a mass scale is simple and is obtained by de-tasselling the male parent. The male panicles at the top are cut off and the (female cobs below can be fertilised only by the) neighbouring lines of the other parents. The male and female elements in maize are located in different parts of the plant. Hybrid vigour is sought to be introduced in *Cumbu*. But the situation is different and more difficult. The male and female elements are in the same flower. So it is difficult to eliminate one of them and prevent self fertilisation. One favourable feature however, is protogyny. The female elements, the stigmas, protrude 3 to 4 days earlier than the anthers. So it becomes possible to effect mass cross-fertilisation to a certain extent by sowing the parents with an interval of a few days, so that the anthesis in one will synchronise with the protrusion of the stigmas in the other. It has been reported by an American worker that seed treated by heat in a particular way results in male sterility. This is being tried at the Millet Breeding Station. The isolation of pure lines that go to produce vigorous hybrids is being done. This work has been taken up as a special scheme in the Millet Section and work on it is in progress.

Lastly a new line of attack to achieve increased millet production has now been launched by the appointment of two Cytogeneticists to the Research Institute. With hard work and a certain amount of luck favouring, it is possible that new forms of plants which are better than the existing ones may be obtained by a shake-up in their genetic composition which is sought to be induced by deep X-rays, colchicine and other violent stimulants. This work has just been taken up. By providing the necessary facilities for their work in this Institute, useful results from this new line of work can be expected.

GLOSSARY.

Tamil Name.	English Name.	Scientific Name.
Cholam	Great Millet	<i>Sorghum vulgare</i>
Cumbu	Bulrush or Spiked Millet...	<i>Pennisetum typhoides</i>
Ragi	Finger Millet	<i>Eleusine coracana</i>
Korra	Italian Millet	<i>Setaria italica</i>
Varagu	Kodo Millet	<i>Paspalum scrobiculatum</i>
Samai	Little Millet	<i>Panicum miliare</i>
Panivaragu	Common Millet	<i>Panicum miliaceum</i>
Kuthiraivali	Sanwa Millet or Barnyard	<i>Echinochloa frumentacea</i>

STRAINS SO FAR EVOLVED IN MILLETS (upto 1948)

Crop.	Strain Nos.	Names of varieties from which selected.	Evolved from Station.	Popular in.
I Cholam	Co. 1 2, 3	Periamanjol cholam Talaivirichan cholam	Coimbatore Coimbatore	Coimbatore Dt. Salem, N. Arcot Chittoor.
	4 to 9	Irrigated Sencholam, Chittrai vellai cholam and Chinnamanjal cholam	Coimbatore	Irrigated areas of Coimbatore, Salem, and N. Arcot.
	10 and 11	Juicy stalked fodder varieties	Coimbatore	Coimbatore
	A. K. P. 1 2	Patcha jonna Tella jonna	Anakapalle	Vizagapatam.
	Guntur strains 4	From Mudda jonna, Budda gidda jonna and yerra jonna	Guntur	Guntur.
	Nandyal 5 Strains	From Cheruku patcha jonna and Gundu patcha jonna	Nandyal	Kurnool and Anantapur.
	Hagari H. 1 Irungu K. 1	Tella jonna Irungu cholam	Bellary Koilpatti	Bellary. Tinnevelly.
	24 Strains	— suited to different localities.		
II Cumbu	3 strains	From African variety Bombay Bajri and Kottapuli cumbu	Coimbatore	Coimbatore, Salem, N. Arcot.
	3 strains 2 strains	From Anakapalle Kattu cumbu and Punjab cumbu	Anakapalle Koilpatti	Vizagapatam Dt. Tinnevelly.
	8 strains			
III Ragi	4 strains	From Gidda aryam and other varieties	Coimbatore	Popular through- out ragi areas in the South.
	7 strains	From Burada chodi, Pairu chodi and other varieties of vizagapatam of different durations from 90 days to 110 days	Anakapalle	Vizagapatam Dt.
	H. 1 (R. 42)	A mutant obtained at Hagari	Hagari	Bellary, Ananta- pur, Kurnool and Guntur.
	12 strains			
IV Tenai or Korra	3 strains	Mosu tenai, Sadai tenai and Perum tenai	Coimbatore	Coimbatore
	1 strain 1 strain	Punasa korra Sena korra	Guntur Nandyal	Guntur. Kurnool and Guntur.
	2 strains	Hagari	Hagari	Bellary, Anantapur.
	7 strains			

(Total 51 strains)