A MONOGRAPH

ON

PAPER AND PAPIER-MACHE

IN BENGAL.

BY

D. N. MOOKERJI, M.A.,

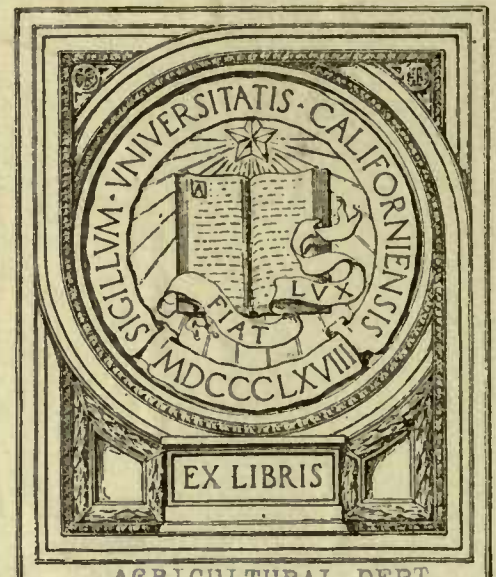
DEPUTY COLLECTOR ON SPECIAL DUTY.

Calcutta:

THE BENGAL SECRETARIAT BOOK DEPOT.

1908.

[*Price—Indian, 2 annas; English, 2d.*]



A MONOGRAPH

ON

PAPER AND PAPIER-MACHE

IN BENGAL.

BY

D. N. MOOKERJI, M.A.,

DEPUTY COLLECTOR ON SPECIAL DUTY.

Calcutta:

THE BENGAL SECRETARIAT BOOK DEPOT.

1908.

Published at the BENGAL SECRETARIAT BOOK DEPÔT,
Writers' Buildings, Calcutta.

OFFICIAL AGENTS.

In India—

MESSRS. THACKER, SPINK & Co., Calcutta and Simla.
MESSRS. NEWMAN & Co., Calcutta.
MESSRS. HIGGINBOTHAM & Co., Madras.
MESSRS. THACKER & Co., LD., Bombay.
MESSRS. A. J. COMBRIDGE & Co., Bombay.
THE SUPERINTENDENT, AMERICAN BAPTIST MISSION PRESS, Rangoon.
MRS. RADHABAI ATMARAM SAGOON, Bombay.
MESSRS. R. CAMBRAY & Co., Calcutta.
RAI SAHIB M. GULAB SINGH & SONS, Proprietors of the Mufid-i-am Press, Lahore, Punjab.
MESSRS. THOMPSON & Co., Madras.
MESSRS. S. MURTHY & Co., Madras.
MESSRS. GOPAL NARAYEN & Co., Bombay.
MESSRS. B. BANERJEE & Co., 25 Cornwallis Street, Calcutta.
MESSRS. S. K. LAHIRI & Co., Printers and Booksellers, College Street, Calcutta.
MESSRS. V. KALYANARAMA IYER & Co., Booksellers, &c., Madras.
MESSRS. D. B. TARAPOREVALA, SONS & Co., Booksellers, Bombay.
MESSRS. G. A. NATESAN & Co., Madras.
MR. N. B. MATHUR, Superintendent, Nazir Kanum Hind Press, Allahabad.
THE CALCUTTA SCHOOL-BOOK SOCIETY.
MR. SUNDER PANDURANG, Bombay.
MESSRS. A. M. AND J. FERGUSON, Ceylon.
MESSRS. TEMPLE & Co., Madras.
MESSRS. COMBRIDGE & Co., Madras.
MESSRS. A. R. PILLAI & Co., Trivandrum.
MESSRS. A. CHAND & Co., Punjab.

In England—

MR. E. A. ARNOLD, 41 and 43 Maddox Street, Bond Street, London, W.
MESSRS. CONSTABLE & Co., 10 Orange Street, Leicester Square, London, W. C.
MESSRS. GRINDLAY & Co., 54 Parliament Street, London, S. W.
MESSRS. KEGAN, PAUL, TRENCH, TRÜBNER & Co., 43 Gerrard Street, Soho, London, W.
MR. B. QUARITCH, 11 Grafton Street, New Bond Street, London, W.
MESSRS. W. THACKER & Co., 2 Creed Lane, London, E. C.
MESSRS. P. S. KING & SON, 2 & 4 Great Smith Street, Westminster, London, S. W.
MESSRS. H. S. KING & Co., 65 Cornhill, London, E. C.
MR. B. H. BLACKWELL, 50-51 Broad Street, Oxford.
MESSRS. DEIGHTON BELL & Co., Cambridge.
MR. T. FISHER UNWIN, 1 Adelphi Terrace, London, W. C.
MESSRS. LUZAC & Co., 46 Great Russell Street, London, W. C.

On the Continent—

MESSRS. R. FRIEDLÄNDER & SOHN, Berlin, N. W. Carlstrasse, 11.
MR. OTTO HARRASSOWITZ, Leipzig.
MR. RUDOLF HAUPT, 1, Dorrienstrasse, Leipzig (Germany).
MR. KARL HIERSEMANN, Leipzig.
MR. ERNEST LEROUX, 28 Rue Bonaparte, Paris.
MR. MARTINUS NIJHOFF, The Hague.

A MONOGRAPH ON PAPER AND PAPIER-MÂCHE IN BENGAL.

Introductory.

Paper consists of a compacted web or felting of vegetable fibres usually, as we know so well, in the form of a thin flexible sheet. The fibres are reduced to a pulp by grinding, beating, etc., and are diluted with water in a vat. Pulp from the vat is then dipped up in a mould from which the water drains away leaving a felted sheet which is then pressed and dried.

Papier Mâche is made of paper-pulp reduced to a paste and then boiled with a solution of gum Arabic or of size to give tenacity to the paste. Articles such as trays, picture-frames, jars, boxes, etc., are shaped by moulding and then ornamented and varnished. Sometimes instead of paste several sheets of paper are glued together and given the required shape. There is no papier mâche industry in Bengal.

The chief difference between hand-made and machine-made paper is that while the former is made in separate sheets of limited sizes, machine-made paper, though limited in width, runs off from the machine in long rolls frequently more than a mile in length without a break. Although the use of machines is all but universal now in Europe and America for ordinary papers, some of the more costly descriptions—drawing paper, for instance—are still hand-made.

Esparto grass, straw and wood are now largely used in the fabrication of pulp suitable for printing paper; bagging, canvas and old rope are used for brown, and other coarse papers; but hitherto no substance has been found to supersede or even to satisfactorily supplant rags for the finer kinds of paper (writing and drawing).

In China and Japan even to the present day paper is made by hand. The Japanese paper is chiefly made from the bark of a kind of mulberry (*Morus papyrifera sativa*) and is known as *kadji*. In China almost every province, if not every district, is said to have its own peculiar paper material.

Historical.

In ancient times various materials were employed in India for writing. Stones, bricks, wooden boards, chips of bamboo, metal plates (especially those of copper), and above all palm-leaves and birch-bark, *bhurja* (Baetula bhojpattr) were all in use. The last is even called *lekhana* or "The writing material," and written documents go by the name of *bhurja*. The art of preparing the bark for use has now been lost. But birch-bark manuscripts are said to be still common in the libraries of the Kashmir pandits. They are, however, very rare in the Khatmundu Library in Nepal, where most of the ancient manuscripts are found written on palm-leaves.

Skins of animals so common in other countries were not much in vogue in India, probably on account of their being ritually impure. Alburini, who visited India with Mahmud of Ghazni and gave a detailed account of the manners and customs, science and literature, arts and industries of the people of this country, expressly says, "The Hindus are not in the habit of writing on hides like the Greeks in ancient times." A reference to this practice is implied in the reply given by Socrates when he was questioned as to why he did not compose books: "I don't transfer knowledge," said he, "from the living hearts of men to the dead hides of sheep."

The use of well-beaten cotton cloth as a writing material by the Hindus is mentioned by Nearchus who was one of the generals of Alexander the Great. The Kanarsese traders still use for their books of business a kind of cloth, called *kaḍatam*, which is covered with a paste of tamarind seed, afterwards blackened with charcoal. The letters are written with chalk or steatite pencils, and the writing is white on black (Mysore or Coorg Gazetteer, 1877, I, 408).

The paper-reed or rush *Cyperus Papyrus* (*Papyrus antiquorum*) afforded to the ancient Egyptians and through them to the Greeks and Romans a convenient and inexpensive writing material. The reed is almost extinct in Egypt now but still abounds on marshy river banks in Abyssinia, Palestine and Sicily. The papyrus was prepared by cutting the central pith of the reed into longitudinal strips which were laid side by side with another layer of strips laid at right angles. The two layers thus prepared were soaked in water, then pressed together to make them adhere, and dried. For books the papyrus was formed into rolls by cementing together a number of sheets.

It will be seen that the fundamental difference between old papyrus and true paper, as we now know it, is that in making paper the raw material is first reduced to pulp, that is, the natural structure is thoroughly broken down so as to separate the component fibres which are then re-arranged to form a new web.

Though as Pliny truly says, "the remembrance of past events depends upon paper (papyrus)" with the irony of fate paper has failed to record its own origin, and much of the early history of the art is matter only for conjecture.

While papyrus was of African origin true paper, in the modern sense of the term, was essentially an Asiatic invention. In China and the neighbouring countries of Eastern Asia, paper was used certainly before the Christian era. The reduction of the natural materials to pulp was done partly with hand tools and partly by soaking or boiling them in lyes. The process of preparing the pulp has undergone much modification in Europe and America, but is essentially the same as was originated in the East some 2,000 years ago.

The manufacture of paper in Europe was first established by the Moors in Spain. In Italy also the art of paper-making was no doubt in the first place established through the Arab occupation of Sicily. Paper, however, continued to be made by hand till at the close of the 18th century. Louis Robert, a clerk in the employment of Messrs. Didst, of the celebrated Essonnes paper-mills near Paris, invented machinery for making the process continuous. This was the greatest advance in the history of the industry and modern paper-making may be said to date from that time.

The first authentic account of paper-making in India dates from the time of the Emperor Akbar, when the art is said to have been introduced into Kashmir. It spread rapidly all over India and displaced the birch-bark and palm-leaves that were previously used for writing. The Persian word for paper, *kagaj*, has been adopted in most Indian languages. This also points to the Mahomedan introduction of the industry. The Sanskrit word for that which is used for writing upon is *patra*, the same as *pātā* in Bengali. The word occurs in the compound *bhurja patra* which does not mean the leaf of the birch tree, for we know that it was not the leaf but the bark of the tree that was used for writing. The word *bhurja patra* simply means the writing materials made of *bhurja* or birch bark.

It is probable, however, that the art of paper-making came from China to the inhabitants of Eastern Himalaya long anterior to the introduction of the paper industry into Kashmir by Akbar. Rajendra Lala Mitra asserts that a "letter-writer" by king Bhoja of Dhāra proves its use in Malwa during the 11th century A. D. (Gough's papers, 16). This king, it may be mentioned, reigned from 1106 to 1142 (?) and was one of the Hindu Chiefs who fought Mahmud of Ghazni. At any rate paper had not yet become common in India, unlike in Mahomedan countries, at this time. Alburini, who has already been quoted, notices the absence of paper and speaks only of *bhurja* bark and palm-leaves as used by the people for writing. He was familiar with paper and expressly says that it was in China that paper was first manufactured. "Its fabrication was introduced into Samarkand by Chinese prisoners and thereupon it was made known in various places to meet the existing demand." This was at the beginning of the 8th century A.D.

Paper manuscripts, dated Vikrama-Samvat 1384 and 1394 (A. D. 1327-28 and 1337-38), the leaves of which are cut according to the size of palm-leaves, have been discovered by Peterson at Anhilvād Paṭan. It is very doubtful if any of the ancient manuscripts from Kashgar, which are written on a peculiar paper, covered with a layer of gypsum, are of Indian origin; Dr. Hoernle

believes that all of them were written in Central Asia. (Indian Paleography by Johann Georg Bühler, Indian Antiquary, volume XXXIII.) During his recent visit to Khatmundu Pandit Haraprosad Shastri acquired a Sanskrit manuscript belonging to the 11th century A. D. written on Nepal paper.

It may be interesting to mention that paper is made in Nepal partly from bamboo and partly form the bark of a small thorny shrub known as Mahadeva's flower (Daphne cannabina). The surface is made glossy by rubbing with a smooth piece of stone. The Daphne paper is generally very thick and is made thicker and stiffer by being coated over with a paste made from the boiled kernel of tamarind seed. It is coloured yellow on one side, probably with turmeric. Thus prepared the paper becomes very hard and looks almost like a piece of hide. But the use of the paste from tamarind seed makes the paper unfit for the transcription of sacred texts. As we shall see later on, in Bengal and perhaps elsewhere in India, a solution of starch made by boiling sunned rice is used for sizing paper. This operation is called *tūlat*. Paper which was subjected to this process was avoided by the old pundits for writing their *pothis*.

Excepting in the case of correspondence with the outside world, the Nepal Government never uses any machine-made foreign paper.

The Daphne paper, though commonly known as Nepal paper, is really mostly made in Bhutan. But the Bhutias also use the bark of another plant locally known as *Diah* for paper making. The process followed is just the same as in China and Japan.

Present Condition.

Paper making is a dying industry in the province. Only a generation ago it was still in a flourishing condition. Within this short period it has completely disappeared from many districts. At present the industry, such as it is, exists only in three districts in Bengal: in Hooghly, Howrah and Murshidabad. In Howrah the industry is confined to a single village named Mainah, three miles from Amta Railway Station in the Uluberia subdivision. In Murshidabad it is confined to two villages named Kristopur and Srirampur, in thana Samserganj in the Jangipur subdivision. In the Hooghly district it is made at Manad and Gossainmalpara in the Polba police-station, at Neala in the Pandua police-station, at Shahbazar and other villages in the Dhaniakhali policestation and at Bali Dewanganj in the Arambagh subdivision.

It is in the hands of a class of Muhammadans known as *Kagjis* or papermakers. The sight of a Kagji village is most melancholy. So far as the paper industry goes the crude hand tools in use in this country have apparently no chance whatever against machinery. At Mainah near Amta in the Uluberia subdivision, Howrah district, out of 100 families that carried on the industry 30 or 35 years ago, only half-a-dozen families still desperately stick to their old profession, the rest having either turned cultivators or labourers or having left the village. The Kagji villages in the Hooghly district are, if possible, only in a worse plight, having been devastated by malaria in addition to the havoc caused by the competition of machine-made paper. Paper making used to be carried on at Nasriganj in the Shahabad district, but the industry ceased to exist some years ago. The Collector of Cuttack reports that about 30 years ago a small paper-making industry was carried on by some Muhammadans of Hariharpur. There are still 7 men who can make paper, but the industry is dead. The paper was made from straw and though rough and coarse was formerly used in the Collectorate Record-room for fly-leaves, but its use has been discontinued for some years.

At Shabazar near Tarkeswar (district Hooghly) in place of 70 *dhenkis* (as the mortar-and-pestle arrangement for producing the pulp is called) only two are still in use. The large pieces of stone that once served as mortars for the *dhenkis* lie scattered about, sometimes serving only as steps for their houses. The people sorrowfully point to the large tanks their forefathers had excavated from the profits of paper and which have now become siltod up containing only a little dirty water.

The only material now used by the Kagjis of Hooghly and Howrah for making paper is waste or refuse paper. Book-binder's shavings are a particularly valued material. Formerly old *san* sacking and old fishing nets

were also used for the manufacture of brown paper, but it has ceased to pay and is no longer used. In the Jangipur subdivision, Murshidabad district, however, jute cuttings are still used for making a kind of brown paper.

But if the essence of the art of paper making be, as already mentioned, the minute subdivision of the raw fibrous material with a view to obtaining the pulp the small industry as still carried on in the province hardly deserves to be called paper making at all. It is a mere recasting of the old material like the production of glassware from broken glass.

The paper produced is a kind of coarse stuff used by Indian merchants and zamindars for keeping their business accounts. This paper is almost exclusively used, for instance, in the office of the Maharajadiraj of Burdwan. It is also used by astrologers for writing people's horoscopes. For, though coarse, it is believed to resist the ravages of insects and climate better than machine-made paper. Towards the close of the Bengali year, when new account books are prepared for the coming year, this paper is a good deal in request. After this during the rest of the year, the demand is small. It appears that the new *swadeshi* movement has done very little to stimulate interest in this industry. The Kagjis think that while people are to a large extent patronising handloom products in the matter of clothing, so far as paper goes they content themselves with the products of the European factories in the country.

An explanation may lie in the fact that unlike clothes a good deal of the paper in ordinary use is devoted only to a very ephemeral purpose where the quality of long endurance has no place to warrant the payment of the much higher price demanded for hand-made paper. Besides, the supply of hand-made paper is too small at present to meet the demand. But soon the present race of work-men who still know the art will be gone, making a revival of the industry or its improvement impossible.

The Kagjis declare it would be very easy for them to produce thicker or thinner paper than they now make if there was a demand. Paper, a little thicker than what is now known as Baleswari, would be very suitable for being made into post-cards and tramway or even railway tickets. Again if the paper is left unsized, it would make good enough blotting paper. The mats upon which the wet sheets are put out to dry, being of very uneven surface, produce a corresponding unevenness in the sheets, but with a slight improvement in the arrangement for drying this could surely be most easily remedied.

Manufacturing Process.

The process of manufacture is as follows:—

Waste paper is mixed with lime and steeped for a week or ten days in a large earthen vat. The lime used is at the rate of three or four seers per maund of waste paper. When sufficiently softened, the mass is pounded under a *dhenki* over a stone mortar. The *dhenki* used for this purpose is very much like that used for husking paddy, only somewhat larger and heavier and the head of the pestle is more strongly bound with iron. The stone mortar is only slightly grooved and consists of a large piece of basaltic stone, some three feet long, one and-a-half feet broad and a foot high.

The paste produced after pounding with the *dhenki* is next kneaded thoroughly in another vat by trampling under feet like potter's clay.

The paste is now washed thoroughly in water over a piece of cotton cloth till all impurities are got rid of and a soft pulp obtained. This is now diluted with water in a large vat. The contents of the vat are constantly stirred with a rod to prevent the pulp settling down, and a little is dipped up at a time in a rectangular skeleton mould, called decle, resting on a fine sieve. This sieve is made of very thin bamboo slips strung together with horse-hair. The sieve is known as *chhapri*, measures 23″ by 18,″ and looks something like a piece of ordinary verandah *chik*, only very much smaller and finer. The chhapri or sieve is stretched over a wooden frame and is held firmly in position by the decle or rectangular mould pressing on its four edges. On withdrawing the mould from the vat in a horizontal position the water within the decle drains off, leaving the chhapri covered with a thin film of fibres, the operator meanwhile shaking the mould so as to evenly distribute the film.

The chhapri covered with the thin film of paper is now taken off from the frame and inverted over a slanting piece of stone covered with a piece of gunny cloth. The chhapri is now rolled away, leaving the film of paper on the stone. The process is repeated and film after film laid down one above another forming a pile. This work is generally done in the morning and the pile is left untouched for the water to drain away till the following day when the sheets still wet are taken up one by one and laid separately on mats to dry in the sun.

After their edges have been trimmed the sheets are next sized or starched one side at a time, and again dried. The starch is obtained by boiling sunned rice in water and is applied with the spongy fibrous shell of a *dhundul, nenua* or *vurul* (Luffa ægyptiaca with the outer skin removed. Some blue stone or copper sulphate is dissolved in the starch to improve the lasting quality of the paper. The starching being light work is generally done by women.

After the sheets have been dried, they are exposed to the night dew to soften them slightly, and next morning they are pressed over a plank with the help of a piece of smooth stone or a conch shell. This, too, is generally dono by women. The paper is now ready.

The paper produced is generally white, but is sometimes coloured blue or yellow. The blue colour is imparted with indigo dissolved in the pulp vat from which the films are dipped up with the chhapri. The yellow colour is given by dissolving turmeric in the starch. Yellow paper is only produced in the Hooghly district.

The implements used, it will thus be seen, are of the crudest kind possible; they consist of some earthen vats, a dhenki for pounding the waste paper, a wooden mould, a bamboo sieve (chhapri), a wooden frame for supporting the chhapri, some mats for drying the sheets, some dhundul fruits for applying the starch, and a piece of plank and a smooth stone for pressing the paper. The chhapri alone is a rather delicate thing. It is procured from Serampore in the Hooghly district where it is made. It costs from Re. 1-4 to Rs. 2, and each piece lasts from $2\frac{1}{2}$ to 3 months.

The dipping up of the pulp with the chhapri is an operation requiring some skill. One man can on an average produce 175 to 200 sheets per day (7 to 8 quires). One woman can size one side of 16 or 20 quires and polish about 12 quires of paper per day. The workmen receive from Rs. 6 to Rs. 10 or Rs. 12 per month according to their skill and outturn of work.

One maund of waste paper makes about 30 seers of country paper.

Paper is made in several sizes:—

	Price per Re.
Bāra rukhi (the width of 12 fingers laid side by side) ...	12 quires.
Sola rukhi or *jangri* (the width of 16 fingers laid side by side).	4 or 5 ,,
Biārā (generally used in zamindari *sarishtas*) ...	8 or 9 ,,
Baleswari white or blue (a thick paper only made at Amta, district Howrah.)	2 ,,

Conclusion.

In this country hand-made paper has apparently no chance against paper made by machine. But in England the most expensive writing and drawing papers are still made by hand. Some 60 or 70 tons of it are said to be made in every work in Great Britain, and on account of its superior strength there is a steady demand for it. In America, however, papers of great strength are manufactured by machinery and not much hand-made paper is produced.

Even in the case of hand-made paper the pulp is always made with machine, only the finest qualities of rags being used for the purpose. The *chhapri*, instead of being made of bamboo slips, consists of a fine wire cloth. The sheets of paper as they leave the mould, instead of being filed up in direct contact with each other, are separated from each other by felt placed between one sheet and the next. The sheets are dried with particular care and the sizing is done with glatine. The glazing is done by machine as in the case of other paper. The greater strength of hand-made paper is supposed to be due partly to the time allowed to the fibres to knit together and partly to the fire expansion permitted them during drying.

But in China and Japan common paper is said to be still made by hand. It would be interesting to ascertain under what conditions this has so long been possible, and what the prospects of the industry may be. It is superfluous to say that there is a good deal in common between the industrial conditions of those countries and India, for instance, the low wages of labour, the simplicity of tools, the general absence of the factory system, etc. Some of the students lately sent to Japan by the Society for the Industrial and Technical Education of Indians, might look into the problem. Government might also obtain a report from some authoritative agent on the subject. Poor, ignorant and broken-spirited, it is hopless to expect the Kagjis to make any improvements in their time-honoured ways without some help from outside. It is impossible to say without an enquiry abroad whether the industry has any chance of being saved at all. The few men who are still engaged in it will soon disappear and their descendants will be forced to betake themselves to other lines of life as best as they can. And then it will be too late to make any effort to revive the industry.

APPENDIX.

Sabai Grass.

Though not used in the manufacture of indigenous paper this wild grass is extensively used in the paper mills of this country where European machinery has been set up. At one time it was proposed to export it to England as a paper material but it could not compete with Esparto grass obtained from Spain.

It is also used for making ropes. *Sabai* ropes are not very strong, being inferior even to jute in this respect ; but they are very cheap. The best *sabai* is said to be grown in Nepal, but by far the largest quantity is produced in the Rajmahal subdivision of the Sonthal Parganas district, and is exported from Sahebganj.

The quantity annually exported from this railway station is between three to four lakhs of maunds. Monghyr and the districts of the Chota Nagpur Division, especially Singhbhum, also produce this grass in the hills and jungles, but it is nowhere systematically cultivated to any extent except in the Rajmahal subdivision of the Sonthal Parganas district. The area under *sabai* grass in the Rajmahal subdivision is estimated at between 20,000 to 25,000 acres.

Like many other grasses *sabai* produces a feathery ear consisting of minute seeds with hairy appendages. These last are nature's device for the wide dissemination of the seeds by winds, etc.

Sabai rejoices in a dry weather and a high open situation. In a year of heavy rainfall the growth is too poor and what is worse, the fibre is too soft. The grass does not grow on the level ground where the soil is water-logged. It is often found growing luxuriantly on steep hill slopes which are practically unfit for ordinary crops. It does not thrive under shade.

The hill sides are thoroughly cleared in the dry season by felling and burning, and the seed is scattered broadcast in the rains without any preparatory ploughing or spading. The seed must be sown from Jeth to Sraban—Bhado is too late for sowing. As the jungle comes up again, two weedings are given, one in Sraban and the other in Aswin.

The plants should be about 18″ apart from each other. If the seedling is found to be too thick in any place the plants should be thinned out. If, on the other hand, the stand is anywhere too poor, the gaps should be filled up with seedling taken from where they are too many.

All this is done in the first year. The grass comes up only a foot or eighteen inches high. This first year's growth is of no value and is not cut, care should also be taken that the field is not burnt this year.

In the second year, too, as in the first, the fields receive two weedings. The grass grows three feet high, and is used to some extent both for paper and for ropes, but it is still very weak.

It is in the third year that the grass attains its maturity. It becomes strong and grows six to seven feet high. From now the fields receive only

one weeding every year—any time between Jeth to Sravan. Nothing must remain in the fields but *sabai*, no trees or scrub jungle nor any other kind of grass. Beyond this annual weeding the fields receive no other attention.

The grass is cut only once a year, any time from the end of October to the end of January. After it is harvested the grass remains dormant, so to say, till the rainy season sets in, when in about a couple of months it shoots up to the height (as already mentioned) of six or seven feet.

The outturn varies a very great deal, some fields giving only 2 or 3 maunds per bigha ($\frac{1}{3}$ acre), while others giving no less than ten times as much. But 12 maunds per bigha may perhaps be taken as a fair average. (See below. Fifteen maunds would probably be nearer the mark.)

In the dry season every year after the grass has been cut the fields are burnt. But this practice should be condemned, as it reduces the outturn of the next year. It is best not to burn the fields at all.

Cattle are very fond of *sabai* and must be kept off the fields from Asarh till the grass is harvested and removed.

A *sabai* plantation practically lasts for ever. Many fields are quite fifty years old. In fact once established the grass takes such a hold of the land as to defy eradication. But the outturn continues good for 15 or 16 years only and then gradually falls off. When the yield becomes so small as to be no longer worth troubling about, the fields are abandoned. And it is only when in the course of time from want of weeding a jungle re-establishes itself that the *sabai* dies out and a fresh plantation becomes possible.

Sabai is grown in the hills which belong to the *paharias* or hill tribes. They pay no revenue to Government, but receive rent from men who cultivate the lands under them. These cultivators are known as *sabai mahajans*. They are up-country men who have to pay Rs. 10 every year to Government before entering the hills and who are debarred from acquiring any right to the lands they cultivate under their *paharia* landlords. The rent is settled by annual agreement, though its amount is practically fixed. After the agreement has been renewed and the rent paid, the *mahajan* has the fields weeded and watched, and when the crop is ready has it cut and carried away to Sahebganj. There the grass is made over to certain balers who bale and deliver it to the various paper mills under contract. The baling is done with the help of hydraulic presses, each bale being $3\frac{1}{2}$ maunds in weight. The balers or contractors have nothing to do with the cultivation of the grass. They pay to Government a royalty of one anna per maund of the grass exported out of the district.

The rent the *mahajan* pays to the *paharia* varies from Rs. 4 to Rs. 8 per bigha ($=\frac{1}{3}$ acre) depending upon the quality of the field and its distance from Sahebganj. The average may be taken as about Rs. 5 per bigha.

Taking the outturn of the grass from a bigha of land as 12 maunds, the *mahajan's* expenses and profits are said to be as follows :—

	Rs.	A.
Rent paid to the *paharia*	5	0
Cost of weeding	0	8
Do. cutting	1	0
Do. tying into bundles and carrying to Sahebganj ...	1	8
Total ...	8	0
Price of 12 maunds of grass at 12 annas per maund ...	9	0
Net profit per bigha	1	0
Ditto acre	3	0

Calculated per maund the *mahajan's* net profit comes to 1 anna 4 pies only.

This account obtain from a man who was himself a *mahajan* (although the largest *mahajan* at Sahebganj) was frankly given as showing the minimum profit the business would yield. Obviously it does not err on the side of showing the profit too high. The average outturn of the grass per bigha should probably be taken as 15 maunds instead of 12 maunds. Else, to use a popular saying, the game would hardly be worth the candle.

The contractors deliver the grass at the paper mills on an average price of from Re. 1-3 to Re. 1-4 per maund. Allowing for the price they pay to the

mahajans and the cost of cleaning and baling of royalty and railway freight they make a net profit of 2 annas per maund.

The Collector of Singbhum reports :—

Sabai grass is not at all cultivated in this district except rarely by villagers in Dhalbhum for the purpose of converting it into ropes. But it grows naturally in abundance in the valley between two adjacent hills. The Government forests and the forests of the Thakur of Anandpur are full of it. It should be burnt in the hot weather, and then it grows abundantly in the rains. But it cannot be burnt in the reserve forests without risk to the trees. Again in the reserved forests the object is to get the area stocked with trees which kill out the grass altogether.

Hence the *sabai* revenue is a diminishing quantity in the reserved forests of their district. The present lessee has undertaken to pay Rs. 51,000 for the three years ending 30th June 1909, against Rs. 1,10,000 paid for the three years ending 30th June 1906 and Rs. 1,26,000 paid for the previous triennium.

As *sabai* grass is dying out fast in the reserved forests, it is expected that when the present lease expires so little will be offered as to render it undesirable to grant another lease owing to risk of fire to the forests by the coolies who cut the grass.

In the forests it is only found scattered here and there and causes much waste of time in collection. The grass should succeed admirably cultivated on the bare hills all along the railway. Under cultivation it will be easily and cheaply harvested. The planting of *sabai* for profit by villagers is well worth cultivation.

D. N. MOOKERJI,

Deputy Collector on special duty.

B. S. Press—4-12-1908—294J—600—C. A. P.