

## Traditional Rice Culture in Kashmir<sup>1</sup>

**BL Puttoo**

118 Apna Vihar, Jammu 180010, Jammu and Kashmir, India (email: puttooobl@rediffmail.com)

### Abstract

*Rice culture and consumption in Kashmir has been in vogue since the drainage of water from Satisar by Kashyap Reshi. Farmers had developed sound traditional knowledge about the parameters for good rice harvest and management of blast (rai) disease. Sustained rice production by adopting organic practices coupled with indigenous farming implements and bullock power was invariably followed. Two approaches – dry (tao) and wet (kenul) – depending upon location and soil under broadcasting and transplantation systems were adopted for growing paddy. Pre-germinated seeds of self-grown and maintained rice varieties were either sown in nursery beds or directly broadcasted and hand weeding done at periodical intervals were enough to have a reasonably good harvest. Use of leftover pre-germinated paddy seeds as a delicious snack known as byail tomul has been elaborated. Many farming operations like transplanting, hand weeding, harvesting, collection, and thrashing were done on family and community basis. Kashmir was rich in rice biodiversity but the cultivars were low yielders and susceptible to diseases. Specific methods of bundling paddy plants after harvest, transportation, stocking, thrashing, and pounding have been described. Bund cropping and double cropping in paddy fields, cattle grazing in harvested fields, weed management after harvest, and de-silting of the water channels on community basis were other hallmarks. Sharing of paddy harvest with local artisans and other related members of community in lieu of the support rendered to the farmer for raising a good crop has been a standing example of the prevalence of barter system. Efforts made at state and national levels to improve rice culture and release of promising varieties that boosted rice productivity on one hand and extinction of indigenous germplasm on the other have been discussed.*

Among the chief crops that ripen in autumn in Kashmir, rice (*Oryza sativa*) (*dhaney/shali* in Kashmiri) has been extensively grown in irrigated lands since time

immemorial for food and fodder purposes. Pounded paddy that yields rice called 'Tomul' has been the staple food of the larger population of the land-locked valley.

1. Based on the author's childhood memories and farming background.

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Good paddy harvest in a year was an index of prosperity. Therefore, rice remained a crop of prime importance in Kashmir agriculture. Consequently the status of a land owner/tenant among the society in terms of landholding was determined by the quantity of seeds he/she required in a season to grow paddy. One *trakh* (= 5 *seers* + 3 *chtaks* = 1 kg) of seed was sufficient for 2 *kanals* (20 *kanals* = 1 ha); i.e., one *khirwar* (= 16 *trakhs*) of seed was required for 32 *kanals* of holding.

Traditional wisdom for a good rice harvest has been described as: “Heavy snow in the winter on mountains to fill the streams in the summer, good rains in March and beginning of April, clear, bright, warm days and cool nights in May, June, July and August with occasional showers and fine weather in September. In September the nights should be very cold. It is asserted that full grains of rice depend on cold dew penetrating the outer husk and swelling and hardening the forming grain” (Lawrence, 1895).

## Preparation of land

Paddy lands were prepared with simple plow that was necessarily light to suit the dwarf hill cattle (Fig. 1), and made of various

durable woods like mulberry (*Morus laevigata*), the ash (*Fraxinus floribunda*) (tree), and apple (*Malus pumila*). The plowshare was tipped with iron. In March, the rice fields that remained undisturbed since last harvest used to be hard, stiff, and full of stubbles and were difficult to plow, especially when snow and frost were scanty. In areas where low-lying and damp paddy lands existed, plowing was done under wet conditions while the dry areas were initially given light irrigation. Just before the plowing operation the household/cattle shed sweepings, ash, and any other waste bulky organic matter/grass material were carried to the paddy fields in deep baskets (*vetchi*) and heaped at different places in the field for spreading manually or in the process of field preparation to supplement the soil fertility. The first plowing was done with a light wooden plow locally known as ‘*Hege Albangi*’. It had a narrow and small shear metal that penetrated just 9–12 cm deep diagonally and loosened the top soil. Subsequent plowings were done cross-wise with another wooden plow that had broader shear metal to remove the furrow ridges.



**Figure 1.** A Kashmiri farmer preparing paddy land using a simple plow with dwarf hill cattle.

The fields were irrigated after a few plowings, if dry, and leveled with the help of a tooth harrow till the soil became soft and muddy. The bunds constructed in different patterns depending upon the slope and topography were shaved with wooden shovels (*bails*) and the shavings spread in fields. The shaved bunds were reinforced with mud layer to plug the holes and tunnels made by burrowing fauna to prevent water seepage. Leveling of the field was further ensured by pressing and working/sweeping the soil surface with feet while holding a stick as support called *lath dein*.

The fields were plowed diagonally in each turn so that no un-plowed furrow remained in between. After two plowings when the weather cleared, turf clods made of silt were dug out from the banks of streams and irrigation channels and spread over the wet fields. This exercise was an annual feature of de-silting the canals on community basis to ensure free flow of irrigation water called *Kulwan*. Clod breaking was done with the help of a wooden mallet individually and the operation conducted in groups. Sometimes a log of heavy wood was also drawn over the plowed furrows by bullocks, with the driver standing on the log. Disintegration of hard clods was finally achieved by the combined action of frost, snow, water, and working with hand.

Two methods of growing rice have been in vogue since long that involve two different methods of soil preparation: (1) *Tao* (dry); and (2) *Kenul* (wet). An old Kashmiri proverb '*Ya kezan ya dazan*' is a popular saying, which means that for rice cultivation the soil should be either absolutely wet or

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absolutely dry. In areas where *tao* cultivation was practiced, generally uplands, the soil was plowed dry, and clods were broken when there was no moisture. Such soils were irrigated to full capacity followed by seed sowing or transplanting of seedlings. In areas where *kenul* method was practiced, mostly low-lying and marshy (*kraaz*) areas, the soils were plowed wet three to four times.

Out of the two methods, *tao* method was considered easier as it involved less labor. The adoption of the methods in a season (*wap/ziyut*) depended upon the prevailing weather conditions and availability of irrigation water besides soil acidity/alkalinity. Thus, farmers followed rotation of the two methods.

## Season

Paddy cultivation was carefully timed so as to fall within a certain period before or after *Nauroz*, the spring day and *Mezan* or commencement of autumn. Delay in cultivation was bound to lead to crop failures. Prompt cultivation was interrupted by problems faced in plowing, sowing of seeds, and non-availability of water at proper time. Paddy ought to be sown within forty days after *Nauroz* or middle of June.

## Planting

### Seed sowing

Paddy seeds for next sowing were carefully selected at the time of threshing. Apparently healthy bold grains that got thrashed just below the thrashing log were collected, cleaned, and dried separately in sun and stored in grass sacks and kept at some safe place for winter. In spring, the seeds were again examined, winnowed, and sun-dried. The seeds were placed in earthen pots and immersed in water for two or three days and the water changed at intervals. The soaked seeds were placed in grass/gunny bags for a few days. Due to generation of heat within the seeds, germination occurred followed by emergence of radicals. The pre-germinated seed lots were then spread on wet grass mats and were ready for sowing in nursery beds or in fields by broadcasting.

### Nursery preparation

The area where paddy seedlings were intended to be raised was traditionally selected near a water source, preferably wetland nearer the dwelling units. This area was called *Thajwan/Thajnaar*. The land was thoroughly plowed 4 to 5 times or even dug with spade (*tanguro*) and shovel (*bail*), followed by thorough mixing of decomposed farmyard manure, bund shaving, reinforcing the bunds with mud to prevent water seepage, leveling and working with tooth harrow (*kanga maj*), and flooding with water. The pre-germinated seeds were filled in small baskets soaked in water to separate the twining radicals and sown thickly. A water level of 2–3 cm in the nursery was

ensured. To ward-off birds, especially crows and sparrows, which were very active during the period, the nursery area was covered with a few grass ropes impregnated with torn cloth pieces, animal skins, dead birds, and empty cans in the middle and ends tied to nearby tree trunks. The elderly farmers were mainly engaged in 'watch and ward' of nursery, checking water levels, and preventing bird/cattle damage till the seedlings attained 5–8 cm height. The seedlings called *danthal/nahail/thal* would become ready for transplanting in fields 40–50 days after sowing, depending upon the weather conditions and altitude.

Uprooting seedlings from nursery was a specialized art and done skillfully to ensure removal of the seedling with entire root system. The operation was generally attended to by a group of skilled farmers who would sit upon inverted earthen pots placed in mud and grasp the root systems with the finger tips followed by gently uprooting, removal of mud, and making handful seedling bundles that were tied with straw or even with seedlings if long enough. The bundles were loaded in baskets/gunny bags and carried to the transplantation sites. Transplanting of the seedlings was done within 24–36 hours.

### Broadcasting method

Broadcasting method of rice culture (*Woattur*) was generally practiced in high altitude areas (>5500 feet amsl) where the growing season was short, and in marshy and low-lying water-prone areas where transplanting was difficult or when

unfavorable weather conditions would get prolonged.

The fields for broadcasting were prepared no sooner the weather conditions like frost and snow would cease. Pre-sprouted paddy seeds were placed in small baskets, held in left side of the waist by an experienced farmer and broadcasted evenly throughout the field. Adequate water level in the field was maintained after sowing. The young seedlings would take a few weeks to establish and grow 12–15 cm tall and were seen above the water level.

### Transplanting method

Transplanting method of rice culture (*Thal ladin*) was adopted in uplands and assured irrigated areas for better yields. Land preparation for this method was similar to broadcasting method. The seedling bundles were placed in advance before the groups of transplanters, comprising men, women, and children, entered bare-footed into the field. They worked in uneven rows moving backwards and did not plant seedlings in rows. However, 2–3 seedlings per hill were planted equidistant.

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## Hand weeding

Rice weeding has been rated as most laborious in rice culture. It is called '*Khushhaba*' in local parlance that has no English equivalent. It is not only weeding but also standing in the mud and water on all four limbs with scorching sun above and cold water below, scuffing in mud and kneading it as a baker kneads flour. It also included the re-transplanting of rice seedlings known as *Roongh* in their right places at proper distances and the process called *Roongabaraie* accompanied by pressing the soft mud gently around the seedling and detection of spurious grasses that were similar to rice in initial phase of growth. The operation used to be a specialized one and was attempted by skilled farmers only. Sometimes this operation was done by feet (*lath*) or when the soil was stiff, by moving cattle up and down in wet fields and was called *Guapan-neind*.

In actual operation, the farmers would enter the field bare-footed, bend, and get support of knees and alternately work with the mud near plant root systems by grasping with hands and finger tips. In the process the emerging weeds were pulled out, bundled, and buried deep in the same field. The root system of genuine paddy seedlings too would get disturbed and the seedlings fall sideways due to this operation besides the churning of top soil. However, such seedlings would become erect overnight with fresh vigor. After a week another hand weeding on similar pattern was undertaken coupled with re-transplanting of seedlings from thick groups in gap areas to maintain plant distance by judgment. The first hand weeding was known as *Kach-neind*,

second as *Sron* or *Mahz-neind*, third as *Mot-neind*, and fourth as *Trowan-neind*, *Dal-neind*, or *Basta phurao*. The fields were further worked a couple of times especially at tillering and just before panicle emergence. At the panicle emergence stage it was customary to withhold water in the fields for some time. This practice, known as '*Huh duin*', was followed to restrict the vegetative growth and ensure more grain formation. Subsequently, the final irrigation (*Pupa sagh*) was given for grain filling and maturity. Due to this irrigation the soil remained moist for a long time in view of lower air temperatures in the season.

The fields were generally inhabited by fauna like snails (*hangni*; *Lymnaea stannalis*), leeches, and slugs (*dadau*) that were considered damaging at initial stage but beneficial at adult stage of the crop because they work around the root system and help release of nutrients.

Farm workers encountered health problems while transplanting and hand weeding especially in swamp/low-lying soils. The workers had insect bites on ankles and fist where the field water touched the skin. These bites resulted in red blisters that caused itching and irritation. The problem was managed by smearing the legs and arms with pine pitch called '*kilum*' in advance that repelled the insects. In some fields leeches were also encountered which would stick on skin and suck the blood of the workers.

## Double/bund cropping

Soybean and other short-duration pulses were sown on paddy bunds by dibbling seeds

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after first weeding. The crop was harvested before paddy along with the adjoining weed flora of the bunds and was dried, bundled, or even twined to form loose ropes, and stored on tree frames. The grain and foliage of the pulse crops were used as a substitute for cattle feed during winter.

Broadcasting of mustard seeds in-situ was also practiced in some paddy fields as *rabi* (postrainy season) crop just at harvest with zero tillage. In some areas, barley/mustard seeds were sown followed by light plowing to cover the seeds and facilitate germination.

## Harvesting

Harvesting of the paddy crop was initiated when the foliage started yellowing and grain filling in the panicles was visible. It was an occasion of joy, community cooperation, and a joint venture at village level. Line harvesting of paddy was considered convenient and was carried out while the farmers sat in the fields. A semicircle toothed sickle having wooden handle was used. The reapers would sit in a row and the distance between reapers in a row was roughly equivalent to one's arm length. Each reaper would hold handful of standing paddy plants with left hand just 10–12 cm above ground and cut them with one stroke. A handful of stalks/bundle was called '*boudh*' (2 *boudhs* = 1 *tsap*; 4 *tsap* = 1 *phula*; 96 *boudhs* = 1

*khur*) (Lawrance, 1895). Yet another set of terminology was used; one handful of rice plants was called *tsaf* (3 *tsaf* tied together = 1 *loovw*; 12 *loovw* = 1 *khur*). A band of workers including men, women, and children harvested the rice manually by operating in a row and placing the harvested plants in *tsaf* in rows with panicles facing the left side of the reaper. This was a picturesque sight to witness. The collection of *tsaf/boudh* row wise and tying three to four bundles together with the basal portion of the plant leaving the panicles undisturbed was an art worth observation.

Preparing *loovw* (bundle) was a skilled job acquired through lot of trials. Three *loovw* were stalked together by placing the panicle region one upon another and keeping the basal portions separate forming a *trisule* called *truiee*. *Truiee* formation ensured quick drying of foliage while in the field. It also facilitated gathering of the produce from the field and its transport to thrashing ground and for temporary stocking in the form of rick (*Theper/Goune*) constructed artistically to give a pyramid look.

Transportation of harvested crop from the field to the thrashing floor was mainly done manually with the help of a *shurien*. It was a straight branch/pole, 5 feet long, 2–3 inches diameter in the middle, with a slot at the base having a long grass rope. *Shurien* was used to accommodate and stock three bundles (*truiee*) one upon the other vertically, tied around, and lifted on back for longer distances by men and directly bundling and lifting on head by women. Two wooden wheeled bullock-driven carts were also used by large landholders.

Both men and women as well as school children would participate to help the quick harvest, bundling, collection, and carrying to thrashing ground and temporary stocking along with grass in artistically designed structures called '*Theprie*' with panicles arranged in the middle.

During this short process of collection and stocking, grain maturity was quickened and subsequent shedding of grains facilitated. However, if the weather remained wet during the operation the prolonged storage in this way would often lead to fermentation of the biomass and grain discoloration.

## Weed management after harvest

In some areas where irrigation water used to be adequate a novel method of weed management was practiced by flooding the paddy fields after harvest and water allowed to stand in the fields for a few weeks. During this period some weed seeds germinated and the weed seedlings or any other plant material rotted and the fields gained humus and fertility.

## Thrashing

Thrashing of paddy was generally attended to after all other *kharif* (rainy season) crops including paddy were harvested and placed safely. Thrashing was done at leisure by fixing wooden planks/logs in between strong wooden pegs in the thrashing ground. In certain cases the thrashing floors were permanently earmarked near the dwelling unit but in certain cases such floors were

temporarily selected in upland paddy fields where water would not stand. The floor surface was smoothed with a wooden *bail* (shovel) by cutting the leftover stubbles and leveling the surface by application of water, vigorous pressing of the floor, and allowing the surface to dry. The harvested bundles were brought from *Theper/Goune* and heaped behind the people who thrashed the paddy. They seized the bundle in two hands and beat/struck the panicle region upon the wooden planks/log that detached the rice grains from panicles. The paddy grains accumulated in front of the beating planks, which were repeatedly cleared of trash or straw by sweeping with a long handled broom made out of local plant material. The harvested produce was further winnowed and filled in gunny bags and emptied in a store called *Kouth/Kothar*. In some areas where the plants were short, threshing was done with cattle.

Yield of paddy obtained under favorable conditions was estimated to be in the ratio of 1:48 (seed:produce) depending upon variety, holding, and method of cultivation. However, crop cutting trials in some locations indicated an average yield of 15–17 maunds (1 maund = 37.5 kg) per acre (Lawrence, 1895).

## Harvest and social obligations

An important aspect of social interdependence and prevalence of barter system in Kashmir was visible when carpenters, barbers, tailors, blacksmiths, and other artisans of a village visited the farmers

during harvest season. The representatives of these classes used to contact each farmer and receive the fixed quantity of paddy in lieu of the services they rendered to them during the year. Street singers, folk groups, beggars, petty shopkeepers, sweetmeat sellers, fisherwomen, vendors, and other poor people used to make beelines in the villages to entertain, sell, and receive alms from the rich harvest.

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## Husking paddy

For husking paddy, every household extensively used a pestle and mortar. The mortar was made of hollowed-out bole of wooden block/stone and the pestle of light hard wood especially of hawthorn tree. Paddy was taken out periodically from the store, dried in sun, and pounded mainly by women, winnowed, and the rice used for consumption.

In some places paddy husking was done under a heavy log hammer that worked on a pivot, raised by men who step on and step off the end away from the hammer. The methods of husking though tiring and laborious particularly for women yielded clean polished rice including broken and crushed grains. However, to reduce



breakage, the grains were thoroughly dried and subjected to repeated husking.

The rice husk mixed with oil cakes was fed to cattle as nutritious feed. The tied bundles of paddy straw being a rich roughage for cattle during winter months was also used for thatching roofs of village houses, making ropes, sacks, *chataiee (patje)*, footwear (*pulhoor*), and many other items of daily use.

## Cultivars

Kashmir was reported to have a large number of local rice germplasm growing in different agroclimatic regions. According to Lawrence (1895), rices of Kashmir were “infinite in variety”. He had observed fifty-three varieties in just one tahsil. Based on grain color, the varieties were grouped as red (*zag*) and white (*prun*). The white rices included *Basmati*, *Kanyun*, *Dudkrir*, *Brez*, *Reban*, *Katchan*, *Imberzal*, *Watihal*, *Babar*, *Mughal boil*, and *Muskh budji*. The good red colored types were *Kai zag*, *Maiwan*, and *Mawar*. The cultivars suited for growing at high elevations included *Niwar*, *Shiwar*, and *Shikyun*. The white rices were esteemed as food by urban people but not liked by the rural population; besides, these varieties would germinate quickly and ripen rapidly but were delicate to stand exposure to cold winds and thus were grown in low altitude areas. They were low yielders and required careful husking. Certain villages in Kashmir were famous for growing peculiar rice varieties namely Telbal near Dal Lake for its white *Chughal*, Lar/Lal for *Anzan*, Salora for *Gudh krihum*,

and Nipur near Anantnagh (Islamabad) for rice in general. On the other hand, red rice varieties could grow in high altitudes, slopy lands, and foothill areas and would withstand chilly irrigation water. Such areas were liable to the ravages of wild animals like bear and pigs but they did not touch red rice varieties owing to their spiky glumes. The variety *Niwar*, best suited for slopes, was short and stout, and yielded sweet nourishing red rice. Kashmiri farmers were known to identify countless rice germplasm at different stages of growth with their foliage passing through different shades of green into the dark bronze of the *Imberzal*. At panicle stage the paddy fields present a most brilliant collection of art blending colors, fragrance, and aroma because of different varieties growing simultaneously in a locality.

## Rogue and other plants

Detection of rogues and counterfeits that appeared generally at weeding time was not difficult, but self-sown rice called *Krer* was a most difficult impostor that produced blackish grains as it matured first. The grains would fall down easily from the ear and would germinate the following year. To mitigate this self-sown rice problem in a particular field, cultivar rotation was effective. Another intruder in paddy field was *hama (Panicum colonum)*. Till the emergence of panicles the *hama* plant looked identical to paddy but at flowering its panicle yielded small grains that fell on the ground and these germinated in the following season. *Hama* was used as cattle feed and was considered nutritious and refreshing.

The effect of cold breeze at grain formation stage on rice crop led to shriveled panicles called '*Handur*'. Such crops had only fodder value. Still aggravated and distressing form of '*Handur*' was known as '*Wohan*'. It happened when cold blasts struck the crop at milky stage resulting in panicle breakage and twisting and formation of white powder. Prevalence of such climatic conditions at maturity stage would bring famine in Kashmir. At this juncture farmers would pray that they may be delivered from *Hakim wa Hakim* – the ruler and doctor – as well as pray for fair weather at harvest time.

Blast of rice is caused by the fungus *Pyricularia oryzae* (Kaul, 1957) and is known as *rai* in Kashmiri parlance. Lawrence (1895) has recorded important epidemiological observations about *rai* disease in Kashmir that is relevant as per present-day verifications. It was observed that low-lying lands shut out from the evening breeze and highly fertile fields were especially prone to the disease. Too much of manure application to paddy fields rendered the rice plants susceptible to *rai*.

Symptoms of *rai* were always expected by the farmers when nights were warm and the mountains to the south and southwest of the valley were lit up by the evening light leading rice plants to lose vitality and the ears were withered and white with an indication of crop destruction. Sometimes *rai*-affected plants were cut to prevent further spread. At times some 'amulet' was collected from holy men and tied to a post in the field; or the holy dust was scattered over the field. Another device for arresting *rai* in paddy fields was to set up a poplar

wand in the rice field and if a widow would walk through the *rai*-stricken field with her head uncovered it was believed that *rai* would be averted. Two types of *rai* symptoms were observed. The common form was where the stem and ear were affected and was called '*Hail rai*'. The other form was where the roots were attacked and the plant withered from root upwards and this was called '*Munj rai*'.

## Rice research in mid-twentieth century

The rice improvement scheme of Kashmir came into operation at Government Agricultural Farm, Khudwani (Anantnagh) on 1<sup>st</sup> February 1941. The farm was situated at 5300 feet altitude and located in typical paddy growing tract. The scheme was jointly financed by the Indian Council of Agricultural Research (ICAR) and State Government on 50:50 basis. The scheme was initially for three years but extended subsequently for eight years. The main objectives of the scheme were to evolve high-yielding types of paddy of good quality and to improve the existing agronomic practices for increased production. Introductions of rice germplasm from exotic sources, their selection and also hybridization programs were initiated to suit the different regions of the state. The work was also extended to Agricultural Farm at Udhampur at 2000 feet altitude representing the tropical region. Initially 270 samples of paddy each of one ounce were obtained in 1941 and 1942 from USA, Russia, and other locations in India like Coimbatore, Cuttack, and Nagina (Uttar Pradesh); these also included

specimens from USA, Japan, China, Bulgaria, Hungary, Australia, Romania, Italy, and Russia (Shangloo, 1971). Testing of the samples was attempted through single plant culture. The promising exotic samples were put in pseudo-factorial test for preliminary comparison. The Chinese, American, and Italian varieties gave better results on account of their short duration and good yield at different trial stations. Among these the Chinese varieties especially China 1039 proved quite promising and produced double the yield compared to the local cultivars. In 1944–45, small quantities of the varieties China 1039, China 1007, China 988, and China 972 were distributed among selected farmers and the foundation seed of all these varieties was also multiplied at Research Farms. By 1950–51 about 490,000 maunds (1 maund = 37.5 kg) of China 1039 was produced both in Government Farms and selected farmers' fields that was enough to cover the entire valley under this variety. This doubled the productivity and the crop was free from blast disease. Chinese selections in general and China 1039 in particular, adapted in all the rice-growing locations of the valley, produced double the yield, responded well to the local fertility levels of soil, and took 125 to 140 days to mature with an average yield of 6000 lbs per acre. The variety China 1039 became popular with the growers. It was a medium coarse variety having white kernel of good milling quality and best suited up to 5500 feet altitude. The steep increase in rice productivity during 1951 to 1969 as a result of newly selected and adapted Chinese varieties in the state is clear from data in Table 1 (Mann, 1971).

China 1039 and IR 8 were found suitable for growing in the plain areas of Jammu. But IR 8 was not found suitable for Kashmir. Giza 14 was found suitable for Poonch and Rajouri regions and China 971 for higher elevations of Kashmir valley. Clousa was found suitable for localities falling within 5200–5500 feet altitudes and produced 10–15% higher yield. Zinc deficiency in Kashmir soils was also observed.

For rice cultivation, the state was divided into two regions on the criteria of agro-climatic conditions:

Region I (Jammu subtropical) having temperature ranging between 37°C and 44°C, with annual rainfall of about 1000 mm and altitude ranging from 214 to 336 m fit for basmati rice culture in addition to Giza 14 and China 1039.

Region II (Kashmir valley and other temperate areas) having temperature ranging between –8°C and 36°C, with annual rainfall of 750 mm and altitude ranging from 1524 to 2591 m (Hamdani, 1971).

China 1039 did not respond to heavy dose of fertilizer and shattering of grains occurred at maturity. To overcome these problems, two cultivars K 60 and K 65 were developed after crossbreeding China 1039 with Rikuu 132 and Norin 8. Other traits identified for breeding work were early maturity, cold tolerance, photoperiod insensitivity, high grain yield, non-shattering plant type, good grain quality, and resistance to blast. In 1965 Khudwani station was included as eighth zonal center under All India Coordinated Rice Improvement Project (Banday, 1971).

**Table 1. Rice productivity in Kashmir during 1951 to 1968.**

Year	Productivity (q acre <sup>-1</sup> )	Remarks
1951–52	3.53	Data based on official estimates
1952–53	3.99	Data based on official estimates
1953–54	3.93	Data based on official estimates
1954–55	4.33	Data based on official estimates
1955–56	4.48	Data based on official estimates
1956–57	4.09	Data based on official estimates
1957–58	3.13	Heavy snowfall in valley during crop maturity
1958–59	4.48	Heavy snowfall in valley during crop maturity
1959–60	4.20	Heavy snowfall in valley during crop maturity
1960–61	4.50	Heavy snowfall in valley during crop maturity
1961–62	4.53	Heavy snowfall in valley during crop maturity
1962–63	4.62	Heavy snowfall in valley during crop maturity
1963–64	7.04	Data based on crop cutting
1964–65	7.68	Data based on crop cutting
1965–66	4.57	Drought conditions during growing season
1966–67	6.65	Drought conditions during growing season
1967–68	8.14	Drought conditions during growing season
1968–69	7.61	Drought conditions during growing season

It was also recognized as a testing station for other coordinating centers like Rice Improvement Project, Hyderabad, India and International Rice Research Institute, Manila, Philippines. In Jammu region another regional center for rice was established at Ponichak (Hamdani, 1971).

## Fermented rice snack

The leftover fermented newly sprouted paddy seed yields a delicious snack called 'Byail tomul'. It is a prized gift from the farming community to their non-farming friends and neighbors. This gesture has been a traditional venture in Kashmir. The process involved in preparing the snack is to sun dry the just sprouted paddy and bake it in an

earthen vessel placed upon soothing fire from cow dung cake (*choola*), cool it and pound the paddy in wooden mortar with pestle, clean the rice of husk, and eat the rice with dry walnut kernels and salt tea.

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