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2 **A Critical Appraisal of Ancient Agricultural Genesis in China**  
3 **Emphasis on Rice, Millet, and Mixed Farming : An Archaeobotanical Endeavor**  
4

5 **Abstract**

6 China has been noted as one of the three sovereign hubs of the origin of ancient agriculture. Specifically,  
7 millets like foxtail millet (*Setaria italica*) and broomcorn millet (*Panicum miliaceum*) and rice (*Oryza*  
8 *sativa*) were and are imperative crops for the ancient as well as present Chinese people. In this regard,  
9 these two crops are valuable in the history of China. It is also a fact that millets and rice belong to the  
10 important river such as Yellow River (North China) and Yangtze River(South China) which are the  
11 ancient centers of Chinese civilization. Millets and rice emerged on the territories of Yellow River and  
12 Yangtze River respectively. It is also unanimously accepted that millets and rice were domesticated at the  
13 same time within a solitary expanse in China but in different regions. The available archaeobotanical  
14 record also suggests the emergence and development of the mixed farming of millets and rice in the  
15 different regions in China. This paper illustrates the archaeobotanical perspectives and retrospectives of  
16 the important crops such as foxtail millet, broomcorn millet, and rice. With this, the imperative  
17 archaeological sites, ancient agricultural activities, agricultural philosophy, crop dispersal, and further  
18 archaeobotanical scenarios since Pre-historic age in China are also the chief themes of this manuscript.

19 **Keywords:** Chinese agriculture, rice, millet, mixed farming, archaeobotany, crop dispersal

20 **Introduction**

21 It is unanimous fact that the origin and dispersal of agriculture have been provided a steady economic  
22 base for the gradual development of human society and the establishment of ancient civilizations. After  
23 the 1960s, many scholars have talked about some of the features about the agriculture origin in China  
24 (Flannery 1973; Tao 1994). It is believed that China is one of the centers for an aboriginal origin of  
25 agriculture of millets (foxtail millet and broomcorn millet) and rice as the chief crops (Crawford 2005).  
26 There are two imperative rivers in China such as Yangtze River, 6500 km long and Yellow River, 5500  
27 km long, which have been associated with significant staple cereals such as rice attributed to the Yangtze  
28 and millets to the Yellow Rivers (Liu et al. 2017). It shows the importance of these two rivers in the  
29 context of millets and rice agriculture in ancient China. It was generally observed that the beginning of  
30 Chinese civilization was first started along the Yellow River in the north rather than the Yangtze River in  
31 the south (W-Ming 2010; Li 2013). Many writings are in support of the origin of rice in South China as  
32 well as the origin of millets in North China. In addition, the research on the origin of millets and rice  
33 proves that the beginning of millets and rice farming is dating back to 10,000–11,000 BP (Wu et al.  
34 2014). Later on, in Neolithic China, millet and rice were cultivated separately and then linked to each  
35 other during their expansion and then a vast region of mixed farming formed (Fuller et al. 2014). The  
36 boundaries and origins of rice, millets, and mixed farming (Fig. 1) have been observed as the vital regions  
37 to search on. So, the important crops of rice and millets have been portrayed as crucial to pounce upon  
38 their origins. As far as the rice is concerned, after the 1970s, the whole world attention was focused in  
39 China, specifically Yangtze River (Crawford and Shen 1998; Yasuda 2002; Fuller et al. 2007; Zong et al.  
40 2007), where the evidence of the earliest rice was found. On the other side, the millets were grown and  
41 have been dominant in the northern parts of China (Chen 2002; Crawford 2005; Zhao 2006). The  
42 available archaeobotanical data shows the facts about the interplay of these two crops in many parts of  
43 China. This mixed farming was mainly recorded and observed in the south, north, and east central China.  
44 (Lu et al. 2009; Wu et al. 2014). In this manuscript, the origins of ancient rice and millets, agricultural

45 philosophy, earliest agricultural domestication, and spread of crops would be conversed with the help of  
46 available archaeobotanical data. It would also be an analytical approach, through which further  
47 constructive and experimental research would also be suggested with the reference of plant archaeology.

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## 51 **The Historical Facts about Ancient Chinese Rice**

52 The ancient Chinese history and the history of rice cannot be split up from each other (Fuller 2011).  
53 There is an immense impact of the early rice on the lives of ancient Chinese people. Because rice has  
54 been noted as a crucial crop in the economy of East Asia, Southeast Asia, and South Asia respectively  
55 (Bray 1994). In this respect, Chinese rice is also a key to study the early lives of the Chinese people.  
56 Therefore, through the minute study on the historical grounds, examinations over rice can be proved a  
57 good hand to establish the facts about the ancient agriculture of this region. Moreover, much of the  
58 population of this region has been provided dietary staple by the rice. On the broader spectrum, this crop  
59 is also important for the other nationals including Southeast Asia, India, and Sri Lanka have also been  
60 dependents on the rice as their food resource (Fuller 2010). As far as the origin of the rice is observed,  
61 some of the researches proved that the center of the rice in China. In this regard, many archaeological  
62 expeditions were executed to find out the dispersal and origins of this crop since 1970s (Gross and Zhao  
63 2014; Lu 2017; Wang et al. 2017). Often, the Asian rice is ascribed and attributed to the Yangtze River  
64 basin that is the origin of the agriculture of early rice (Fuller 2006). Some believe that there are more than  
65 one origins of the rice as the land of India (Vavilov 1926), South China (Ding 1957), Southeast Asia  
66 (Spencer 1963), and the Yangtze River (Cohen 2011) got attentions of the researchers as being the ancient  
67 hubs of the rice. In addition, there are two other theories surround the facts that the Yangtze River basin is  
68 the epic center of early rice and rice dispersed towards the other places within the country or outside the  
69 country like Southeast Asia. Another theory is about the archaeological theory that provides the facts that  
70 there some other centers of the rice except China. According to (Fuller 2006), the centers of the early rice  
71 are the middle or lower Yangtze River of South China and the Ganges Valley of India. For the actuality,  
72 more archaeobotanical expeditions (microremains and macroremains) are required about the Ganges  
73 Valley and South China (the Yangtze River). Therefore, rice agriculture has been inevitable for both East  
74 and South Asia. On the other hand, we have also some clues to establish the actuality that the Chinese rice  
75 spread from China to Indus Valley (South Asia), Ganges Valley, Mekong, and the central plains of China  
76 (Fuller 2011). Another evidence portrays the fact that the *indica* form of rice dispersed towards Ganges  
77 Valley, may be in the form of the loans of Chinese crops, which has also been proved by the Chinese  
78 legends. According to Chinese legends, there was a trade between China and India. Overall, rice is one of  
79 the most significant cereal crops in the world, and in South and East Asia, its appearance as a cultivated  
80 subsistence plant has been examined well in the sense of archaeology (Zhao 1998). Frequent  
81 archaeobotanical studies suggested the Yangtze River as the origin of rice, because this river is proved the  
82 dwelling of ancient rice. On the other side, lower Yangtze, Huai River, Houli culture, southwest Henan,  
83 and Shandong (Fuller 2011) are also admitted proofs as being the ancient hubs of this crop in China.  
84 After 1970s, some discoveries and researches proved that the center of the rice farming is the Yangtze  
85 River basin with the important and critical Hemudu site (7000-6300 BP) which is a waterlogged Neolithic  
86 site where the quantities of rice were recovered. With the collective arguments, this site was said to be the  
87 earliest center of rice agriculture. The site of Hemudu is vital and emblematic because the rice  
88 domestication was concluded well after the phase of Hemudu culture (Fuller and Qin 2009). Other  
89 important archaeological sites of this region such as Bashidang and Pengtoushan (ca.6500-5500 B.C) are  
90 also claimed the ancient centers of the rice farming. The site of Bashidang has the enormous rice grains,  
91 which are mostly wild rice. In further archaeological expeditions proved that, the region of the Yangtze  
92 River (early and middle reaches) is actually, the starting point of the rice agriculture early rice (Lu et al.  
93 2002; Cohen 2011; Shin-ichi 2010; Wu et al. 2014). Except for this, Pleistocene cave and Early Holocene  
94 residents in the southern part of China are also measured as the primordial regions of rice farming (Fuller

95 2011). Indirectly, there are also some precipitate arguments that the early ceramics in China between  
96 18000-15000 years ago can be linked with the earliest farming habits in this region. It is unfair to link  
97 these earliest ceramics with the earliest farming activities (Zhang and Hung 2008). The auxiliary study  
98 may fetch the accurate realities of the true verdict. Again moving towards the middle Yangtze River  
99 region, the Daxi culture about 6000 years ago and the Majiabang culture in the lower Yangtze River  
100 exhibit the portrait of the early vital nutrition of the ancient societies including rice that belongs to the  
101 Neolithic. In the later Neolithic period, Chengtoushan site (Daxi culture) from 4400-3300 B.C. has been  
102 scrutinized the paddy field acquainted with rice. Another archaeological site called Kuahuqiao has also  
103 been associated with the early rice farming, and interestingly the earliest textile activities observed in this  
104 site like Hemudu site. From these archaeological sites, rice dispersed towards some other regions of the  
105 southern parts of China such as Fujian, Guangdong, and Guangxi in between 5000- 4500 BP. Overall  
106 observation is in favor of the Hemudu as the center of the earliest rice (Cohen 2011). Furthermore, in the  
107 central east parts of China, the Huai River, and Han River, are indicated as the additional hubs of the  
108 early rice farming. The site of Yuezhuang (ca. 8000 BP) and the site of Xihe (ca. 8000 BP) (Jin et al.  
109 2014) have also been entitled with the pivotal sites of East China for the early record of rice farming,  
110 accompanied by Xianrendong and Diaotonghuan sites in Jiangxi Province, have also been proposed as  
111 the earliest sites for the rice cultivation (Zhao 1998). Again talking about the southern side, the evidence  
112 of the early rice field systems from the eastern side of Choudun and Caoxieshan sites (Taihu Lake) also  
113 shows the small hollows with the negation of puddle fields too. As far as the wild rice is concerned, it  
114 belongs to Zhejiang province (*Zhujiajian* site), where this crop is recorded dated back to 8750–6200 BP.  
115 This wild rice, which was intact in form with the length of 2.0 mm (inner side) and 2.2 mm glumes (outer  
116 side), is also considered to be the vital progress about the history of the rice. Interestingly, whether rice  
117 was also recovered from the eastern part of China but three wild rice species only found in the southern  
118 side such as; *O. perennis*, *O. officinalis* and *O. meyeriana* (Tang et al. 1993). This discovery of the rice  
119 may have solid proofs of the rice dispersal from the southern side to the eastern side of China. In coastal  
120 southeast China, such as Fujian province, the available archaeobotanical record proves the rice farming  
121 around 5000 cal. BP that is also the region of Yangtze River (Ma et al., 2016). From the northern part of  
122 China, the Jiahu site is valuable because the discovery of rice from this site is valuable that shows the  
123 early stage of rice farming in the north of China. Possibly, the early rice of the Lower Yangtze, The  
124 Middle Yangtze, Lower Huaihe River, Lower Hanshui and Upper Huai River Basin are considered the  
125 earliest centers of ancient rice. In addition, all of the ancient Chinese rice circulated around its three  
126 stages, the primary stage (8000 B.C.) secondary stage (8000-5000 B.C.), and the Mature stage(5000 B.C.).

## 127 **Millets: origin and development**

128 Generally speaking, foxtail millet (*Setaria italica*), broomcorn millet (*Panicum miliaceum*), bulrush  
129 millets (*Permisetum* spp.), finger millet (*Eleusine corocaaa*), and barnyard millets (*Echinochloa* spp.) have  
130 been categorized in the species of millet. In broader spectrum, in the land of China, almost 14 species of  
131 *Setaria* have been noted through which seven are suggested in the northerner part that shows the vital place  
132 for the millets is North China, specifically along the Yellow River and its tributaries. As far as the earliest  
133 millets agriculture of northern side is observed, many of the archaeological sites have existed which have  
134 the record of millet cultivation in the middle reaches of the Yellow River in the loess plateau along the  
135 foothills. According to Ming author Wang Xiangjin, foxtail millet and broomcorn have been thought to be  
136 as Northern rather than southern crops in China. And not only in the past but *Setaria* in the present era is  
137 still economically imperative crop in North China and here millets are known as the dominant traditional  
138 crops (Crawford 2005). Many times the word “North China” has been discussed in different writings that  
139 is renowned as being the center of millets cultivation has been referred as the massive area from the  
140 Yellow River Valley to Inner Mongolia, where Nanzhuangtou, and Donghulin, and Shizitan sites have  
141 also existed. So far as the wild ancestor of foxtail millet is observed, the *Setaria viridis* can also be judged  
142 on the upper floodplains of Yellow River in the north of China. In this respect, the northern part of China  
143 is believed to be the abode of ancient millets as rice in southern part. Except for China, the remains of

144 millets like *Setaria* and *Panicum*, have also been obtained from the archaeological sites in the other part of  
145 the world (Weber and Fuller 2008). In esteemed observation, foxtail millet and broomcorn are thought to  
146 have origination in the northern part of China. And present archaeobotanical evidence has proved that no  
147 later than 8000 cal. BP, both foxtail and broomcorn millets were cultivated in northern China (Lu et al.  
148 2009; Stevens et al. 2016). With the available archaeobotanical record, the Cishan site in the Northern  
149 part of China has broomcorn millet as early as 10000 BP, and foxtail millet 8700 BP. At some other sites  
150 like in northwestern China, Xinglongguo site (Zhao 2005b) and in the lower Yellow River region,  
151 Yuezhuang site, foxtail millet has been recovered which is given the dates no earlier than 8700 BP and  
152 7800 BP respectively. The new data about the millets from the site of Dadiwan also gives the well-built  
153 arguments which denominate the new prospect in the field of ancient agriculture. There are also some  
154 other sites like Nanzhuangtou (11500-1100 BP) and Donghulin(1100-900 BP) have been documented  
155 with the presence of millets earlier than above-mentioned sites in the plain of North China. Again in the  
156 northern China, at the site of Xiachuan, the cultivation of millet is observed which is dated back to 9000  
157 years. In the Shanxi, the Yangshao site of Banpo also has the record of foxtail millet (c. 5000 years) that  
158 also depicts the wide range of millet cultivation in North China. The region of middle Yellow River is  
159 also very crucial because the sites named Shawoli (Wang 1984) and Peiligang (Institute of Archaeology  
160 CASS 1994) portray the existence of millets which leads the new horizon in the research of millets  
161 agriculture. The millets from Xinglonggou site recovered by flotation, with their accurate dating and clear  
162 recognition, are also thought to be some of the earliest domesticated millets in China. In the Yiluo Valley  
163 of North China, millets have been noted with other plant fossils. Here, foxtail millet was cultivated during  
164 the Early Neolithic period and was the chief crop for at least four millennia. As far as broomcorn millet is  
165 observed, it was considerably less important throughout the sequence. This fixture can also be assumed as  
166 the cross-examination of the millet agriculture in Yiluo Valley. With the help of starch granules, it was  
167 observed that foxtail millet and broomcorn millet in the site of Shizitan (North China) are key factors to  
168 know about the ancient agricultural activities of the people that is dated back to ca.12700-11600 BP. In  
169 central China, the Yangshao, Dawenkou, and Longshan traditions, as well as the existence of millets,  
170 portray the ancient habits of the ancient people of this region (Chen 2002). In Shandong, Liangchengzhen  
171 site also has the existence of millets dualistically with the domestication of animals (Lanhart et al. 2011).  
172 The archaeobotanical record suggests that Cishan, southern Hebei, Peiligang, northern Henan, Houli  
173 culture sites, West Shandong, Xinglongwa, Manchuria, and Dadiwan culture, Gansu have been noted as  
174 the ancient hubs of millets. In addition, foxtail millet and broomcorn millet were among the world's most  
175 vital and ancient domesticated crops. They were staple foods in the semiarid regions of China, Japan,  
176 Russia, India, and Korea and even in the whole Eurasian continent before the fame of rice and wheat  
177 respectively (Fuller 2006).

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## 179 **Mixed Farming**

180 Mixed farming is a key factor in China, which opens separate discussion of ancient agriculture.  
181 Interestingly, in the early 1990s, the idea of the mixed farming of rice-millet was suggested. Later  
182 on, keen research on rice and then millets, mixed farming has also got the attention of the researchers to  
183 ponder over it. Comparing the mixed farming of China with Southwest Asia and Mesoamerica,  
184 agriculture in ancient China portrays the significance of a dualistic configuration with millet in the north  
185 and rice in the south. It is also observed that the rice and millet cultivation were equally exchanged during  
186 their growth and shaped a vast region of mixed farming in China. In a broader spectrum, the contact  
187 between millet and rice cultivation, the crop formation of the four central mixed farming expanses is in a  
188 continual progression of regulation, with the assortment of foxtail millet in the southward dispersal of  
189 millet agriculture and moderate *Oryza japonica* in the northern dispersal of rice farming. Mixed farming is  
190 considered not to be an inaccessible form of agriculture but is the result of the dispersal of millet and rice

191 farming. As far as the routes of the dispersal of millet are concerned, some of the researches were  
192 conducted to sketch the route of the dispersal of millet across Eurasia in early food habits (Spengler et al.  
193 2014) then dispersal of rice in East Asia connected with theoretical language family spread models. In  
194 China, the unanimous accepted point is that millet and rice farming are alienated along the edges of the  
195 Huaihe River and the Qinling Mountains (Zhao 2011b). It is also a fact that China has long been  
196 recognized as a center of origin for both rice and millets. It is a fact that millet is one of the significant  
197 cereal crops which have also been judged as a single or dualistic crop in China. Whether millets have  
198 been cultivated in North China in earliest times but the interplay of millets with rice in Neolithic central  
199 China has also been noted, the specific accomplishment of this verdict can be seen in the site of Baligang  
200 and in the Huai River Valley (Yan, 1997). With this, another source of mixed farming can also be  
201 observed in the Province of Shandong (Crawford et al. 2005). Some other renowned sites which are  
202 known to mixed farming such as Yiluo Valley (Lee et al. 2007), Hanshui Valley (Weisskopf et al. 2015a),  
203 Chengdu Plain (Guedes 2011), Yungui Plateau (Li et al. 2016), and Guanzhong Basin (Zhang et al.  
204 2010b). In the Middle Yellow River region, a key site named Tanghu site, which also reveals a new proof  
205 of broomcorn millet and rice mixed farming in 7800 BP that is a worthy source to understand the farming  
206 process of the two crops in the ancient Yellow River Civilization. In the south and north China, rice and  
207 millet farming was dispersed into each other's zone leading to mixed farming, specifically in between  
208 4500-3800 B.C. (Yangshao period). In addition, mixed rice and millet farming prolonged between the two  
209 rivers like the Yellow River and the Middle Yangtze by around 4000 B.C. Around 4000–3500 cal. BP, In  
210 south China, millets were also domesticated with rice in the two renowned sites Huangguashan and  
211 Pingfengshan in Fujian province through which the local ancient activities can also be judged with this  
212 example of mixed farming in China (Deng et al. 2017). There are some interesting points about the  
213 beginning of mixed farming as in Shandong's Houli culture where millets and rice were cultivated  
214 together in the earliest times. But still, it is ambiguous. But according to (Fuller and Stevens 2017), in  
215 4000 B.C, the cultivation of millets and rice was begun. Furthermore, mixed farming existed not only in  
216 China but also in the Taiwan region, Japan, Thailand, and Korea which depicts the importance and value  
217 of mixed farming.

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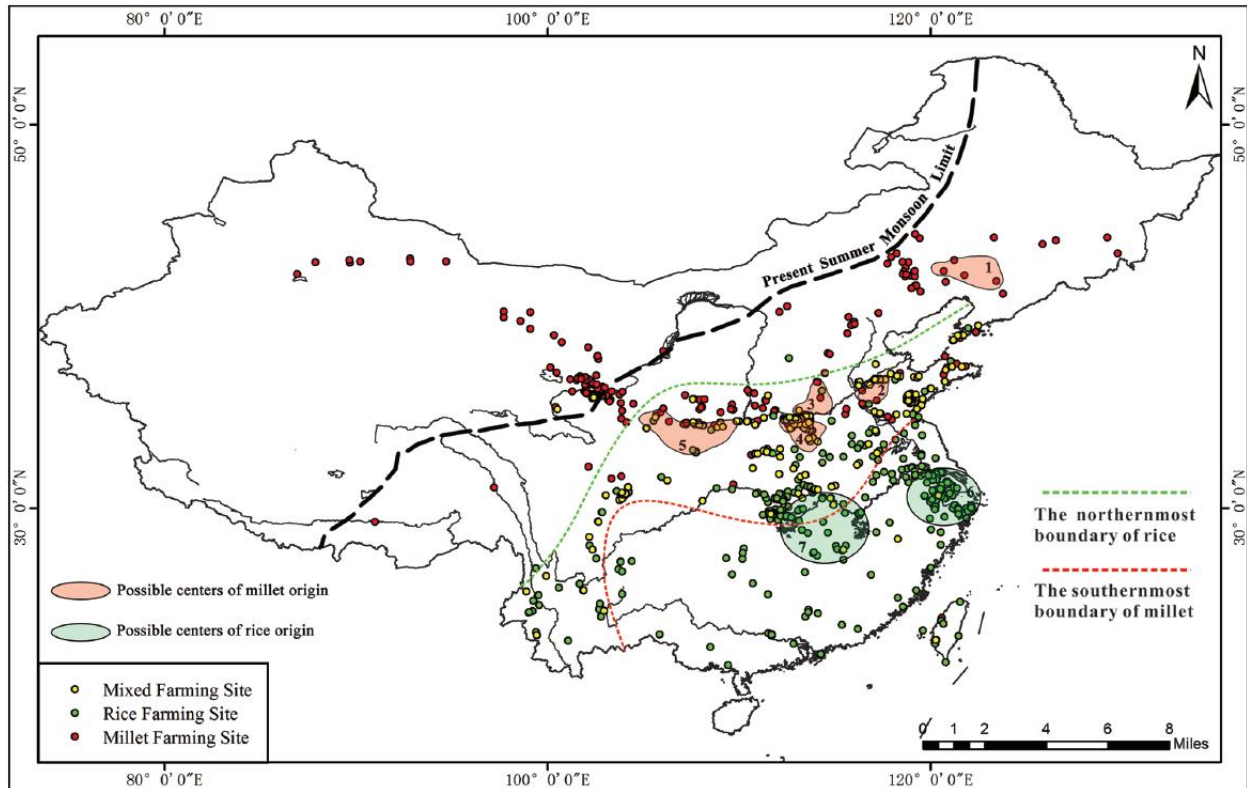


Fig. 1 The boundaries, origins, and distribution of rice, millet, and mixed farming (Adapted from He et al. 2017)

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## 225 Dispersal of millets and rice

226 The millets and rice, both these crops denominate in the sense of domestication and cultivation. The  
 227 ancient archaeobotanical record also confirmed that both millets and rice have been noted as the crops  
 228 which spread out from their origins to nearby and farfetched areas. As it is true that the origin and  
 229 dispersal of agriculture presented a steady economic base for the establishment of both ancient people and  
 230 civilization (Chen et al. 2015a; Iriarte et al. 2004). There are many reasons for this act in China. The  
 231 extensively discussed language-farming spreading hypothesis prevail that augmented inhabitants within  
 232 early farming societies lead to a mass departure in search of new land for agriculture and resultantly many  
 233 languages also scattered (Bellwood, 2005). So, the vitality of the farmers with the language families  
 234 increased towards wide range regions. The spreading of millets also occurred from China to Taiwan and  
 235 rice was also dispersed from the South China (Yangtze Basin) to South Asia as well as other territories.  
 236 Both the crops have been observed as dispersing crops within and outside the boundaries of China. It is  
 237 also evident that millets dispersed away from Gansu toward Qinghai and then south to Sichuan (Chen et  
 238 al. 2015). The spreading of millets also perceived from Tibetan Plateau and rice from the Yangtze basin  
 239 to Guangdong and Fujian in 2500 B.C. (Zhang and Hung, 2010). The dispersal of millets to Korean in the  
 240 Middle Chulmun period, and also out of northeast China to the southeastern side of Siberia, a moment  
 241 away from beyond Jilin and Heilongjiang (Sergusheva and Vostresov, 2009), is considered to be the vital  
 242 one. The spreading of rice from southern part of China toward South Asia with the language speaking of  
 243 Austroasiatic and Austronesian is also considered as valuable (Silva et al. 2016). This rice dispersal  
 244 toward South Asia is also precious because the Indus Valley Civilization regions, particularly, Pakistan  
 245 and India got clear-cut influence from China regarding rice agriculture (Sameer et al. 2018). The Chinese  
 246 legends confirm that there had been the activities of trade between China and India in the ancient era

247 through the rice was spread from China to India. The trade activities of China with Northern Pakistan,  
248 Kashmir also depict the cultural exchange which resultantly shows the facts of similarities in the tools for  
249 harvesting. The existence of the stone knives for harvesting in Kashmir is also recorded in China which  
250 portrays the diffusion in the field of technology as well. In the Late Harappan period, at the site of Pirak  
251 in Pakistan, such harvesting tools also observed (Jarrige 1995). Interestingly, the archaeological  
252 researches also prove that Ganges Valley and lower Yangtze River are the centers of early rice agriculture.  
253 Above all, the wild progenitors (*Oryza rufipogon* and *Oryza nivara*) of Asian rice can be seen as native to  
254 Southeast and South Asia moving from a southern part of Chinese. It is also obvious that after 5000 cal.  
255 BP, the millets dispersed toward Eurasia and specifically According to (Motuzaite-Matuzeviciute et al.  
256 2013), broomcorn millet become visible in Europe after 3600 cal. BP and it is proved with the resources  
257 of the archaeobotanical record. As far as its dispersal toward Taiwan, the routes of southeast China has  
258 been noted through which millets entered into Taiwan. And its entrance into Thailand is Yunnan and  
259 possibly Guangxi province of southwestern China through which the millets also entered there.

260

### 261 **Prehistoric development of rice, millets, and mixed farming**

262 The agriculture in ancient China proposes the significance the cultivation of millets in the northern  
263 parts and rice in the southern part as well as the formation of mixed farming with the results of exchange  
264 of millets and rice from south to north. But on the contrary side, there are some ambiguities to prove exact  
265 origin and evolution regarding mixed farming agriculture in China. The supporting arguments about  
266 mixed farming can be suggested as the movement of human, environmental conditions or cultural  
267 contacts among ancient people. Some of the clues suggest that the millet and rice cultivated in separate  
268 regions and conditions and then both contacted during their progression which ultimately formed mixed  
269 farming during the Neolithic period in China (Qin 2012). Some scholars suggested the regions and  
270 boundaries of the millets, rice, and mixed farming agriculture. But it is proved that almost all the sites  
271 related to mixed farming are situated between Yangtze and Yellow River. According to (He et al. 2017),  
272 A gigantic sector of mixed farming is observed in Neolithic China and he also suggested the boundaries  
273 and important sites in this context. The site of Gaolizhai in Dalian (northmost–eastmost), the site of  
274 Shifodong in Gengma (southmost–westmost) and some other sites like Jiaoridang and Haimenkou have  
275 been concluded as the earliest regions or origins of mixed farming. Systematically, the interaction  
276 between rice and millets depict the progression of mixed farming in the regions of Central Plains and  
277 Haidai around 8000 BP. In a deep sense, the millets emerged in North China and then dispersed toward  
278 other regions. Both foxtail millet and broomcorn millets dominated each other in different times and  
279 cultures. During the Peiligang culture (9000–7000 BP), the broomcorn millet was a chief crop, in later  
280 stages, the foxtail millet became dominant in the culture of Longshan (5000–4000 BP). In the Neolithic  
281 China, both millet and rice have been noted as the chief crops which dominated many regions from the  
282 Yangtze to Yellow Rivers. Whether millet emerged in North China but its dispersal toward other regions  
283 makes it a valuable crop that detains countless region in China. The same case with the early rice, having  
284 the ancient origins in Yangtze River, Huai River, and Lower Hanshui River, it developed and captured  
285 many of the areas and also became dominant crop. The dispersal of rice within China and neighboring  
286 countries formulates this crop valuable and significant in the Prehistoric Era. In early farming societies  
287 (Underhill 2013; Shelach and Teng, 2013) which represent the Neolithic Era, both millet and rice portray  
288 the early agriculture through which the ancient Chinese Civilization has been attributed.

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294 **Exchange route between millet and rice farming**

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296 The early cultivation of millet and rice in China separately and in dualistic portrays the ancient human  
297 with the agricultural activities and its functions. In this regard, the geographical analysis can be a good  
298 hand to depict the ancient routes and dispersal of millet and rice through which the mixed farming came  
299 to a form. Analyzing this judgment, there has been a point some routes such as east, west, central, and  
300 common route. As far as the eastern route is observed, this route is pointed in the eastern alluvial plain  
301 between the regions of Haidai and Jiangzhe along the coastline of the Yellow Sea. On the other side, the  
302 west route or passage lies between the region of Ganqing and the Chengdu Plain (Chen et al. 2007). Here  
303 mostly, the millet is found on almost all the sites which are situated on the Sichuan Basin. Here, some  
304 ancient sites with the attribute of mixed farming have also existed like Guiyuanqiao and Baodun. The  
305 central route is positioned between the Hanshui Valley and Central Plains which is considered to be the  
306 combined route as well. Here, the vital site is Baligang that is situated in the Nanyang Basin. Interestingly,  
307 through Nanyang Basin, this central route is valuable because the dispersal of rice from northwards  
308 started here and the dispersal of and millet from southwards. There is also a common route or corridor  
309 until the Longshan culture. This route represents some sites with millets as well as rice. Through this  
310 route, the Longshan culture is Liangzhu represented well with the archaeobotanical record of  
311 archaeological sites with the reference of millet and rice agriculture.

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314 **Conclusion**

315  
316 According to above discussion, rice, millet, and mixed farming have been drawn with the specification of  
317 origin and evolution. With the help of archaeobotanical data of the mentioned sites, the retrospective  
318 analysis formed. Geographically, the earliest mixed farming emerged in the Central Plains and the region  
319 of Haidai around 8000 BP. The discussion about specified routes or corridors depict the key features of  
320 rice and millets agriculture as well as their integration. With this, the highlighted centers of rice and  
321 millets portray the valuable place in the ancient history of Chinese agriculture through which the  
322 development of above-mentioned crops can also be focused on in further researches. The available  
323 archaeobotanical records also suggest the three reasons for the structure of mixed farming such as the  
324 human migration, environment, cultural exchange or communication, and demographic expansions that  
325 can be expected to have dispersed the major language families as well. This writing evaluates the  
326 interaction between rice and millets with the momentous arguments. Some important features of this  
327 manuscript depict the evidence that rice was brought into farming within the three delineated regions  
328 between 6500 and 5500 B.C., the centers of early rice like the Lower Yangtze, the Middle  
329 Yangtze, Lower Huaihe River, Lower Hanshui and Upper Huai River Basin, same the origins and centers  
330 of the millet are Cishan, southern Hebei, Peiligang, northern Henan, Houli culture sites, West Shandong,  
331 Xinglongwa, Manchuria, and Dadiwan culture, and Gansu. Finally, the dispersal of millet and rice with  
332 the identification of trajectories provides the precision conditions as well as the dominance of millet and  
333 rice in Neolithic China. Some of the ambiguities in time span and the transition in ancient agriculture can  
334 also be resolved regarding rice, millet, and mixed farming in further archaeobotanical researches.

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