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## SOCIOECONOMIC EVALUATION OF WILD RICE AS FAMINE FOOD CROP IN SOUTHERN DARFUR STATE, SUDAN

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### ABSTRACT

Wild rice (*Oryza barthii*) is increasingly used in Sudan as a food crop. Wild rice is a whole grain, rich in minerals, vitamins, protein, starch, dietary fiber and various phytochemicals; and yet low in fat, with a beneficial fatty acids profile. The objective of this study was to evaluate the socioeconomic significance of wild rice as a famine food crop in Darfur state of Sudan. A study was conducted in five districts (Tullus, Gadad, Demso, Katila, and Umshtoor) in South Darfur in Sudan. Primary data were obtained through a face-to-face semi-questionnaire interview on 146 households; supplemented with interviews of key informants and group discussions. All respondents (100%) not only attested to knowing wild rice and its growth habits, but also consumption (93.8%) of the crop. Wild rice reportedly grows naturally and widely in valleys, although it was dismally exploited by the local population. It is harvested manually and traditionally; and sold mostly in the local markets, without post-harvest value additions. The crop is consumed in various meals, but mainly in the form of porridge. Some respondents (13%) used the crop in times of famine. Wild rice is stored in traditional containers (95.9%) for periods ranging from 8 to 12 years without visible storage problems.

*Key Words:* Households, *Oryza barthii*, rice grains

### RÉSUMÉ

Le riz sauvage (*Oryza barthii*) est de plus en plus utilisé au Soudan comme culture vivrière. Le riz sauvage est un grain entier, riche en minéraux, vitamines, protéines, amidon, fibres alimentaires et divers composés phytochimiques ; et pourtant faible en matières grasses, avec un profil d'acides gras bénéfiques. L'objectif de cette étude était d'évaluer l'importance socio-économique du riz sauvage en tant que culture vivrière de famine dans l'État du Darfour au Soudan. Une étude a été menée dans cinq

districts (Tullus, Gadad, Demso, Katila et Umshtoor) du Sud-Darfour au Soudan. Les données primaires ont été obtenues par le biais d'un entretien semi-questionnaire en face-à-face auprès de 146 ménages; complétée par des entretiens avec des informateurs clés et des discussions de groupe. Tous les répondants (100%) connaissent le riz sauvage et ses habitudes de croissance, et ils consomment 93,8% de la récolte. Le riz sauvage pousserait naturellement et largement dans les vallées, bien qu'il ait été lamentablement exploité par la population locale. Il est récolté manuellement et traditionnellement ; et vendus principalement sur les marchés locaux, sans valeur ajoutée post-récolte. La récolte est consommée dans divers repas, mais principalement sous forme de bouillie. Certains répondants (13%) ont utilisé la récolte en période de famine. Le riz sauvage est stocké dans des conteneurs traditionnels (95,9%) pendant des périodes allant de 8 à 12 ans sans problèmes de stockage visibles.

*Mots Clés:* Ménages, *Oryza barthii*, grains de riz

## INTRODUCTION

Wild rice (*Oryza barthii*) is increasingly used in Sudan as a food crop. *Oryza barthii* (*Oryza abreviligulata*) is the wild progenitor of cultivated African rice. It is an annual cereal that commonly grows in seasonally flooded areas from Mauritania to Tanzania and from the Sudan to Botswana (Linares, 2002). The nomenclature of wild rice in Africa has been very confused. It is now considered that *Oryza barthii* is the direct ancestor of *Oryza glaberrima*. The name *Oryza breviligulata* is now considered invalid, as is *Oryza stapfii* the name previously given to the weedy races of African rice (Norman *et al.*, 1996).

Darfur, one of the largest regions in Sudan is increasingly dependent on wild rice for food. The region is inhabited by over million people; in spite of the recurrent drought, desertification and political and social conflicts that have all resulted in a dire socioeconomic situation. Famine is a recurrent phenomenon and people rely on nontraditional staple foods to cope with it (Salih, 1991).

A famine food, often a wild plant, is any inexpensive or readily available foodstuff used to nourish people in times of food shortage and starvation (Mukhtar, 2002). Wild crops become critical whenever staple foods reserved get exhausted, thus rendering rural communities directly dependent on market supplies. Knowledge of these wild plants is useful during famine times and is usually passed on orally across generations. This knowledge

often remains strong in more traditional communities, especially those in the developing world, where the need for alternative food source is still great (Bukhari, 2014). The potential of wild rice as a famine food is widely recognised in Darfur; however its potential is still under exploited. The objective of this study was to evaluate the socioeconomic significance of wild rice as famine food crop in Darfur State in the Sudan.

## METHODOLOGY

A field survey was conducted in the locality of Tullus, one of the administrative cities of the state of South Darfur; located in western Sudan at latitude 8.30° 13' 13" N and longitude 15° 32' 27.45" E. Data were collected using both quantitative and qualitative approaches. The study adopted a survey of 146 respondents selected purposely using the stratified accidental sampling method (Table 1). The selection was made from five districts, namely Tullus, Gadad, Demso, Katela and Umshtoor.

The districts were selected based on set criteria for sample selection, but mainly locations in different directions to cover as many areas as possible. The study sample size, which comprised of household heads and women, was determined using the Accidental Procedure (Thomson, 2002). A semi-structured questionnaire, which was pretested prior to its use, was employed for the interview.

TABLE 1. Distribution of face-face survey respondents according to districts in south. Darfur, Sudan

Districts	Total number of individuals	Percentage (%)
Tullus	130	89.0
Gadad	7	4.8
Demso	2	1.4
Katela	5	3.4
Umshtoor	2	1.4
Total	146	100

The study also involved focus group discussions (FGDs), randomly selected from the survey sample; and each comprising of about 12 members. Also, the study included key informants; persons more knowledgeable about wild rice, agronomy, postharvest, crop protection, nutrition and marketability.

The data collected were analysed using the Statistical Package for Social Scientists (SPSS) software, version 22, by adopting descriptive statistics to obtain the frequency distribution and percentages of respondents with regard to the different socio-economic and cultural variables of the study.

## RESULTS AND DISCUSSION

**Knowledge of the wild rice.** Table 2 shows that all the respondents (100%) knew wild rice as a food crop, though found largely in the wild. Consumption of the crop is rather historical because it is asserted that by the eleventh to the fourteenth centuries, muslim scholars journeying overland to western Sudan established the presence of a fully evolved rice culture including wild rice in the recipes. Porteres (1976) contends that wild rice was widely consumed and traded in South and West Darfur.

**Nature of growth.** Table 3 shows that the vast majority of the respondents (96.6%) believed

TABLE 2. Frequency distribution of sample individuals according to the Knowledge of the wild rice (N=146)

Knowledge of wild rice	Frequency	Percentage (%)
Yes	146	100.0
No	0.00	0.00

that wild rice grew naturally, while a miniscule number of respondents (3.4%) contended that the crop grows both naturally and is cultivated. This confirms what the name connotes that the crop is principally from the wild in Darfur, in spite of its growing significance. Owing to its suitability as an excellent famine food crop for this climate fragile region, efforts towards its domestication and varietal improvement will go a way to alleviate food insecurity among communities during extreme weather events.

**Pests and insects.** Only a few respondents (15.8%) stated that wild rice suffers serious pest problems in Darfur state. Sarla and Mallikarjuna-Swamy (2005) contended that wild rice is generally pest resistant and has the ability to grow on infertile, acid soil. Several studies indicate that wild species of rice are an important source of plant hopper resistance genes (Fujita *et al.*, 2013; Hu *et al.*, 2016; Sarao *et al.*, 2016). Hence, tolerance to pests and diseases makes this plant an excellent famine food source in Darfur region, and development efforts should leverage from it.

**Harvest method.** Majority of the respondents (96.6%) agreed that harvesting of wild rice in Darfur is done manually; while the rest of them reported use of either machines, or both machines and manual labour (Table 4).

Manual harvesting predominates not only because the crop is from the wild but also, stallholder farmers in Darfur cannot afford the cost of the implements. Neither are commercial returns to investment in the equipment yet evaluated. Wild rice, like in the

case of other crops of growing importance needs advancement of mechanised technologies to accelerate field harvesting, a task that is executed inefficiently largely women and the youth.

**Consumption of wild rice.** Wild rice is consumed by both humans and livestock in Darfur. Table 5 shows that most respondents (93.8%) consumed wild rice though to variable levels. In spite of the variable quantities

consumed per *capita*, wild rice is acceptable to the majority of the population Darfur; a fact that again makes the crop a very good famine food. Wild rice is reportedly rich in carbohydrates and proteins; and is mainly consumed as whole grains (Norman and Kebe, 2005). It provides more calories and protein than cassava, maize or sorghum/millet. Together with other types of rice, wild rice forms the basis of the diet of millions of people in Sub-Saharan Africa (Norman and Kebe,

TABLE 3. Frequency distribution of respondents according to nature of growth of wild rice in Darfur, Sudan (N=146)

Item	Respondents	Frequency	Percentage (%)
Nature of growth	Naturally	141	96.6
	Cultivated and naturally	5	3.4
The exposed to pests and insects	Yes	23	15.8
	No	123	84.2

TABLE 4. Frequency distribution of respondents according to harvesting of wild rice in Darfur, Sudan (N=146)

Item	Respondents	Frequency	Percentage (%)
Harvesting	Manually	141	96.6
	Machine	1	0.7
	Machine and manually	4	2.8

TABLE 5. Frequency distribution of respondents according to consumption of wild rice in Darfur, Sudan (N=146)

Item	Reply	Frequency	Percentage (%)
Consumption of wild rice	Yes	137	93.8
	No	9	6.2
Time of using wild rice	At the time famine	19	13
	On special occasions	96	4.1
	In all time	107	73.3
	At the time famine and on special occasions	14	9.6

2005). Most of the respondents (73.3%) attested to using wild rice at all times; however, 13% indicated using it mainly in times of famine and 4.1% for specific occasions.

Over 73% of the respondents prepared wild rice variously (Table 6); while 9.6% cooked wild rice with meat and onions, and others (0.7%) prepared it with milk and margarine. Also, 11% prepared it in the form of porridge; while others (4.8%) fortified it with sugar.

Table 7 illustrates that more than half of the respondents (52.7%) used wild rice crop residues as animal feed. Rice husks and rice bran which have not immediate alternative uses, are used as animal feeds, particularly during drought when fodder is scarce (Vadiveloo *et al.*, 2009).

**Wild rice in local markets.** Several respondents (52.7%) agreed that wild rice was available in local markets in Darfur, while the rest contended that the crop was dismally marketed in the region (Table 8). The reasons for such a hooping proportion of respondents being unaware about the presence of wild rice

in the local markets could not be deciphered during the interviews.

**Storage problems.** Most of the respondents (95.9%) reported no problems associated with storage (Table 9), which again adds credence to the value of the species as a famine food in Darfur. Proper storage of wild rice is a key factor in maintaining its qualities and food values. Physical and cooking properties such as head rice yield, pasting, volume expansion and water absorption of rice regularly changes during storage (Champagne, 2004).

Wild rice is stored in different containers in Darfur, namely gunny bags “*Alshawal*” (80.1%), mud jars (5.5%), large mud container “*Dabanga*” (4.8%) and underground dump” (9.5%). Grains can be stored indoors, outdoor or at the underground level, in structures ranging from those of mud to modern bins. The storage containers are built from a variety of locally available materials differing in design, shape, size, and functions (Kanwar and Sharma, 2003; Channal *et al.*, 2004).

TABLE 6. Frequency distribution of respondents according to meals prepared from wild rice in Darfur, Sudan (N=146)

Meals prepared from wild rice	Frequency	Percentage (%)
Meat and onions	14	9.6
Milk and margarine	1	0.7
Meat and onions+milk and margarine	1	0.7
Porridge	16	11
With sugar	7	4.8
Total	107	73.3

TABLE 7. Frequency distribution of respondents according to the usage of wild rice as fodder in Darfur, Sudan (N=146)

Item	Respondents	Frequency	Percentage (%)
Usage of wild rice as fodder	Yes	77	52.7
	No	69	47.3

TABLE 8. Frequency distribution of respondents according to availability of wild rice at local market in Darfur, Sudan (N=146)

Item	Respondents	Frequency	Percentage (%)
Availability of wild rice at local market	Yes	77	52.7
	No	69	47.3
Price per kilo (US\$)	0.043	41	28.1
	0.086	87	59.6
	0.130	12	8.2
	0.173	1	0.7

1 US\$ is equivalent to 566 Sudanese pounds

TABLE 9. Frequency distribution of respondents according to storage of wild rice in Darfur, Sudan (N=146)

Item	Sample individuals	Frequency	Percentage (%)
Problems attributed to storage	Yes	6	4.1
	No	140	95.9
Storage containers	Gunny bags "Shawal"	117	80.1
	Mud jars	8	5.5
	Large mud container "Dabnga"	7	4.8
	underground dump	14	9.5
Storage period	1-4 years	104	71.2
	4-8 years	29	19.9
	8-12 years	13	8.9

Most of the respondents (71.2%) indicated that wild rice could be stored securely for 1 to 4 years; while 19.9% mentioned 4 to 8 years of secure storage time. Only 8.9% reported the highest range of between 8 to 12 years. Such extended periods of secure storage are essential for keeping famine food stuffs intact under smallholder settings in Darfur.

### CONCLUSION

The wild rice plant grows in Darfur largely naturally in valleys and is widely spread. It is increasingly used as a famine food in the region. Wild rice is consumed in many

different forms, namely porridge, rice with meat and onions and with milk and margarine. It is stored in traditional containers for periods ranging from 8 to 12 years. Wild rice is available in local markets at community affordable prices.

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