Content list available at http://epubs.icar.org.in, www.kiran.nic.in; ISSN: 0970-6429

Indian Journal of Hill Farming

June 2018, Volume 31, Issue 1, Page 188-192

Zabo: A Time-tested Integrated Farming System Practiced by Chakhesang Tribe of Nagaland

R. K. Singh*. Hannah K . Asangla . R. Bharali . D. Borkotoky

KrishiVigyan Kendra, ICAR-NRC on Mithun, Porba, Phek, Pfutsero- 797107, Nagaland

ARTICLE INFO

Article history:
Received 23 May 2016
Revision Received 15 November 2016
Accepted 13 January 2017

Key words:
Zabo, Chakhesang, Integrated Farming System, Soil erosion and Water conservation

ABSTRACT

"Zabo" is a traditional way of integrating different farm enterprise in such a way that the overall income of the farmers can be enhanced. The practice was developed some 80-100 year back by the ingenious and skillful farmers of Chakhesang tribe of the Kikrumavillage. The term Zabo is derived from the word zabö, which is used for "impounding runoff water" in chokri dialect. It is also known as Dzüdü or Ruza system in certain areas of Phek. Zabo system of farming has the combination of forestry, horticulture, agriculture, fishery and animal husbandry with well-founded soil and water conservation base. Ponds are dug in the middle to store the water channelized from hilltop. Water channelized from the top, first goes to the silt retention tank where silt is retained and then it is stored in pond for irrigation. Cattle and buffalo are the common livestock reared near the pond, vegetables and fruits are grown on bunds or just below the livestock enclosures. The water for irrigation to rice fields is taken from the pond through the livestock enclosures so that the dung and urine of the animals can be carried to the fields. This serves as a good source of nutrients for the paddy crops. Jhum or shifting cultivation is another farming system practiced in the region, where farmers practices the mixed cropping, however in zabo system along with the crops, fruits, livestock and fishes are also integrated in very scientific manner. The present study in Kikruma village of Phek district, Nagaland was undertaken for systematically recording of various components practised under zabo system and their significance. The data on various aspect of zabo farming system were collected through group discussions, structured interviews and questionnaires from 40 respondents of the village. The findings of the study revealed that cereals, pulses and vegetables are the major components of jhum, whereas in zabo other than cereals pulses and vegetable, fruits, livestock and fish are also integrated. The average yield of paddy in zabo system was recorded to be 1.95 tonnes/ha which is higher than jhum(1.0 ton/ha)with high seed requirement. From the study it can be concluded that zabo farming system was developed in Kikrumavillage of Phek district of Nagaland, the system is remunerative, sustainable, preserves soil fertility and eco-friendly. The system has built in mechanism of integrating different farming options like cereals, pulses, vegetable, fruits, livestock and fishery.

1. Introduction

"Zabo" is age old practice developed by Chakhesang tribe. The practice was evolved by people of Kikruma region that later spread to entire Chakhesang inhabited region of Phek, Nagaland. The system devised by ingenious and skilful tribal people is unique in water resource development and management and seem to be matchless. The term Zabo is derived from the Chokri dialect that also known as Dzüdü or Ruza system in other parts of the region.

*Corresponding author:rksingh3@gmail.com

In zabo different farming components like horticulture, agronomical crops, fishery and animal husbandry has been integrated with forest ecosystem with well-founded soil and water conservation base. Water resource development, water management and protection of the environment are inherent aspects of the system (Sharma *et al.,* 1994). This system has an inbuilt water harvesting and recycling systems with well-founded conservation base to control soil erosion, proper management of soil fertility and available water (Singh *et al.,* 2012). It is a viable practice of resource management and maintenance of ecological balance.Construction of the pond is the pivot point of the entire continuum (Figure 1). Ponds are dug in the middle to harvest the water from protected forest land. Hilltops above the pond, act as catchments area and water is channelized through inlet channels from the catchment area to the silt retention tanks. Water is stored in the silt retention tank for 2 or 3 days before transferring to the main ponds. This allows the silt coming with runoff water to settle in the silt retention tanks, which are cleaned annually. Sometimes, more than one pond is constructed in such a way that the surplus water from one pond flows down to the pond below. Water is released from the pond for irrigation through an outlet at its base. The water from the ponds is transferred to fields either through open channels or by bamboo channels. Water is passed through animal yard before taking it to the paddy fields for irrigation and while passing through the animal yard water carries the dung and urine of the animals, thus it helps in maintaining soil fertility (Singh, 2007). Vegetables and fruits like squash, colocasia, cucurbits, banana, papaya, oranges and citrus are cultivated on the banks of the pond. Vegetables are also grown just below the livestock enclosures. Livestock like cattle, goat, sheep, pig and poultry are raised beside the pond (Singh *et al.,* 2012).

In zabo system, paddy fields are located at the lower elevations and during poor rains on an average two supplementary irrigations are given from the zabo ponds that help to get yield between 3-4 tonnes per hectare (Sharma and Sharma, 2003).Paddy cum fish culture is commonly practised and farmers raise the fishes in their wet rice terraces. A small pit is dug out in the middle of the rice field and fish fingerlings are released in the fields during the month of July. Paddy matures by the end of October and by then paddy field dries or in case there is excess water then it is drained out from the fields before harvesting of the paddy. As the ponds dry fishes move into the pit and from there fishes are harvested. On an average 50 – 60 kg of fish is harvested per hectare from paddy cum fish culture (Singh *et al.,* 2012).

2. Material and Methods

The study was conducted at Kikruma village of Phek district, Nagaland. The village was chosen purposely because of the belief of local people that the practice of zabo has started in this village. The village is inhabited by Chakhesang tribe and they speak Chokri dialect. The questionnaire was prepared in English language and narrated to respondents in Chokri by the local youth from the same village. Most of the respondents were well versed with the English language and in case any term was not clear to them, then same was explained to them in Chokri to make them understand better. The data were collected through group discussions, structured interviews and questionnaires from 40 respondents of the village. Respondents were requested to tick the correct answer in the closed questions present in the questionnaire, however for the open-ended questions, they were asked to answer in their own words.The study employed both primary and secondary data, interviews and semi-structuredquestionnaireswere used

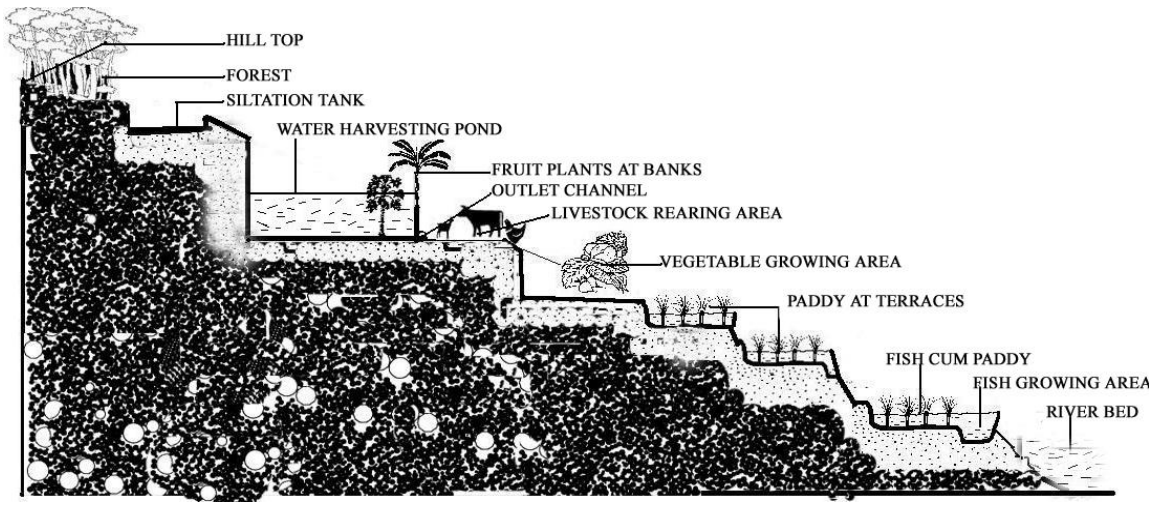

Figure 1. Land management in ZABO farming system adopted from Singh *et al.,* 2012

for collecting primary data on practices, yield and their perceptions about the practice of zabo. Secondary data was collected from the field through documentary analysis such as reports from the state government publications, journals, magazines, research reports as well as other publications.Collected data were coded, entered in excel sheet, verified and cleaned before analysis.Microsoft Excel 2013 Home and Student version were used to analyse the data. The data was summarised in frequencies and percentages and then presented in tables, however seed rate and yield data were subjected to descriptive analysis.

3. Results and Discussion

The demographic profile of the respondents helps in understanding their behaviour, expression and response to the questions posed to them. The result presented in Table 1 revealed that most of the respondents (65%) were aged above than 45 years, 75 percent of them were males. All the respondents were literate, but the majority (60%) were having educational qualification up to high school. About 60 percent of the respondents were having experience of the farming more than 20 years.Paddy and maize is the major crop being cultivated in the village.Among the paddy they have more than 50 local cultivars but many of them have been lost with time.At present they are cultivating only 17 different cultivars, listed in table 2.Regarding origin of the zabo system, the respondents unanimously suggested that it was originated in Kikruma village around 80 - 100 years back. The literal meaning of the term “zabo” was narrated by them as “impounding runoff water” which, alternatively, known as “ruza”. The system was devised primary for meeting the irrigation needs of paddy cultivated on terraces. Tanyekemuga and Kumunyo were the local cultivar of paddy recorded by the respondents as major paddy cultivars cultivated on the terraces. Further, most of the respondent listed monkey bean, cabbage, springonion, beans, tree tomato, chow-chow, pumpkin, colocasia, brinjal as vegetables cultivated in zabo, whereas banana, plum, peach and pear were common fruits planted on bunds or near ponds (Table 2 and 3). Further the respondents have revealed that the Common carp (*Cyprinuscarpio*) and Pfutho (*Channastriatus*) are the common fishes reared in the ponds dug in the middle of terraces, whereas cattle, buffalo and goats are commonly reared livestock in the zabo system.Paddy is the major component of the zabo farming system,the data pertaining to cultural practices and yield of paddy had been collected and analyzed in the present study.All the participant have opined that the time of sowing for nursery is mid-March to mid-April, weeding is the only cultural practice adopted by the farmers and they transplantin terraces in the month of June.However their opinion about plant to plant and row to row spacing were divided. 37.50 % of the farmers said that theymaintain 10x10 cm spacing whereas 62.50% favoured10x15 cm spacing. Regarding the water depthin the terraces

Table 1. Demographic characteristics of the respondents

Respondents characteristics		**Distribution of Respondents**	
		Frequency	**Percent**
Age	Young (20 - 35 years)	6	15.00
	Early adulthood (36 - 45 years)	8	20.00
	Late adulthood (above than 45 years)	26	65.00
Gender	Male	30	75.00
	Female	10	25.00
Education	High School	24	60.00
	Intermediate	10	25.00
	Graduate and above	6	15.00
Farming Experience	Low (upto 10 years)	6	15.00
	Medium (10-20 years)	10	25.00
	High (more than 20 years)	24	60.00

Table 2. List of paddy (*Oryzasativa*) varieties cultivated in the jhum and terraces in Zabo system

Sl. No	**Lowland Paddy Cultivars (Terraces)**		**Upland Paddy Cultivars (Jhum)**
	Sticky	**Non-sticky**	
1	Nyode	Tanyekemuga	Thüri (Sticky)
2	Nyogo	Ribolü	Kumunyothuziri
3	RhunyoKüzü	White tanie	Richolü
4	PvakhrüMunyo	Red tanie	Rüli
5	DzüchoMünyotanie	Chide tanie	Caha (black rice)
6	Kumunyode	Thüvüri	

Table 3. List of other crops, their local cultivars and enterprises taken in the zabo system

Sl. No	Plant/livestock/fish	Scientific Name	Local Name
Cereals and pulses			
1.	Maize	*Zea mays*	Kotho, Methohubo,TüphreSako, KhünelüSako, TüphreSako (Non sticky) and Tieciesako and Tsakotsa (Sticky)
2.	Garden pea	*Pisumsativum*	Motor
3.	Perilla	*Perillafrutescens*	Chitsü, Küna
4.	Job's tears	*Coixlacryma*	Küse
5.	Rajma	*Phaseolus vulgaris*	Batüse
6.	Beans	*Vignaspp*	Kürhise, KütireseBatüseTikünalüse
Vegetables			
7.	Mustard	*Brassica juncea*	Gakri
8.	Spring onion	*Allium cepa*	Thomüra
9.	Garlic	*Allium sativum*	Chimuri
10.	Local garlic	*Allium tuberosum*	Khova
11.	Brinjal	*Solanum*	Khadeshie
12.	Chilli	*Capsicum spp.*	Rajathise (Boronithise), Nhathise, Pethimithise, Thisesebu, Thisekütü
13.	Tomato	*Lycopersiconesculentum*	Ga-o Borase
14.	Tree tomato	*Solanumbetaceum*	SüBongalse
15.	Cabbage	*Brassica oleraceae*	Kobi, Kobinirhu
16.	Potato	*Solanumtuberosum*	Galu
17.	Cucumber	*Cucumissativus*	Zotutuse
18.	Sponge gourd	*Luffacylindrica*	Rasuse
19.	Chow-chow	*Sechiumedule*	Skuish
20.	Pumpkin	*Cucurbita spp.*	Lemu
21.	Colocasia	*Colocasiaesculenta*	Bitha, Bide, Bicho, KhusobiThükhrübi, Biyhozho, Bile, Bivene, Tokuswulubi
22.	Monkey bean	*Parkiaspeciosa*	Yangchak
Fruits			
23.	Papaya	*Carica papaya*	Thünothipuse
24.	Banana	*Musa spp.*	Lümüngase
25.	Plum	*Prunusdomestica*	Agashü,
26.	Peach	*Prunuspersica*	Chühoshie
27.	Lemon	*Citrus limon*	SüsuseKükhro
28.	Pomelo	*Citrus grandis*	Süsusekuzho
29.	Pomegranate	*Punicagranatum*	Turashie
30.	Indian Gooseberry	*Phyllanthusemblica*	Nyikhroshie
31.	Wild Apple	*Docyniaindica*	Tsüphose
Livestock			
32.	Cattle	*Bosindicus*	Metho
33.	Buffalo	*Bubalusarneecarabanesis*	Külie
34.	Goat	*Capra aegagrushircus*	Temvü
Fishes			
35.	Common carp	*Cyprinuscarpio*	Common carp
36.	Asian Snakehead	*Channastriatus*	Pfutho
37.	Snail	*Viviparus (Bellamyia) bengalensis&Pomaceacanaliculata*	Nula

32.50% farmers maintain 10 cm water depth, whereas 67.50% said that they maintain 20 cm water depth (Table 4).

Table 4. Cultural practices adopted in paddy cultivationunder zabo system

Cultural Practices	Parameters	Distribution of Respondents	
		Frequency	Percent
Time of Sowing	March-April	40	100.00
Nursery Management	Weeding	40	100.00
Time of Transplanting	June	40	100.00
Spacing	10x10 cm	15	37.50
	10x15 cm	25	62.50
Water depth	10 cm	13	32.50
	20 cm	27	67.50

The seed rate varied from 15.00 to 60.00 kg with an average of 37.90 (±2.49) kg. The yield of paddy in zabo terraces varied from 1400 to 2500 kg/ha with an average of 1950.00 (±50.0) kg/ha, whereas it found to be less than 1.0 ton/ha in Jhum. The fish yield in the small ponds dug in the middle of paddy field under paddy cum fish culture ranged from 40.00 to 80.00 kg with an average of 61.75 (±1.79) kg/ha (Table 5).

Table 5. Seed rate, yield of paddy and fish under zabo system

Variable	Average (Kg/Ha)	Minimum (Kg/Ha)	Maximum (Kg/Ha)
Seed rate of paddy	37.90 (±2.49)	15.00	60.00
Paddy yield	1950.00 (±50.0)	1400.00	2500.00
Fish yield	61.75 (±1.79)	40.00	80.00

Conclusions

Zabo is a distinctive and time tested farming system developed by our forefather and still common among the chakhesang tribe of Nagaland.These indigenous practices and knowledge about the sustainable utilization of land, water, soil, forest, livestock and fish resources is unique. This is an attempt to document and preserve the information for future generations and spread the knowledge about this unique system among masses and researchers.

Acknowledgements

Authors express their thankfulness for the help and support rendered by the people of Kikruma village of the Phek, Nagaland. We also acknowledge the help and support rendered by the Director, ICAR-NRC on Mithun, Nagaland in carrying out the study.

References

Pulamte L (2008). Indigenous agricultural systems of Northeast India; India, Science and Technology: 2008, published by National Institute of Science, Technology and Development Studies (NISTADS), CSIR, New Delhi. http://www.nistads.res.in/indiasnt2008/t6rural/t6rur18.htm downloaded on 15th October 2010.

Sharma UC., Prasad RN,Sonowal(1994). An indigenous technique of soil and water conservation in north eastern region- The Zabo system of farming. Soil and Water Conservation Challenges and Opportunities. In: Proceeding of 8th, ISCO conference (Bhushan LS, Abrol IP and Rama Mohan Rao MS Eds). Oxford and IBH, publication Co. Pvt. Ltd., New Delhi (India). pp. 969-975.

Sharma U C.,V Sharma (2003). The "Zabo" soil and water management and conservation system in northeast India: tribal beliefs in development of water resources and their impact on society – an historical account of a success story. In: Proceedings of the UNESCO/IAHS/IWHA symposium held in Rome, December 2003. IAHS Publ. 286, 2004, pp. 184–192.

Singh AK (2007). Indigenous water management system by the farmers of northeastern hill region, Leisa India, March 2007. http://www.agriculturesnetwork.org/magazines/india/1-farmers-coming together/indigenous-water –management –system –by –the-farmers/at download/article_pdf downloaded on 23rd September 2016.

Singh RK., Singh V,C Rajkhowa(2012). Zabo: A Traditional Way of Integrated Farming. In: Resilient Shifting Cultivation: Challenges and Opportunities (Deka BC, Patra MK, Thirugnanavel A, Chatterjee D, Borah Tasvina R and Ngachan SV Eds). ICAR Research Complex for NEH Region, Nagaland Centre, Medziphema, Nagaland. pp. 114-117.