OPEN SOURCE DIGITAL PLATFORM FOR LANDRACES (OSDPL)

Uday K. Nagubandi, Kanna K. Siripurapu, and Bhagya Laxmi

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1. Introduction

Digitalization is revolutionizing the world and changing our lives. It is no longer a thing of the future but a present reality. Digitalization has permeated into every aspect of human society - business, health care, banking, entertainment, industry, and even agriculture. Digital applications such as the automated steering systems, field robots and drones, data-driven targeted application of water, pesticides, and fertilisers, soil analysis sensors, etc. have already made inroads into agriculture. The integration of modern data technologies enhances the efficiency of seed planting and increases productivity (BIOPRO, 2018). However, the application of digital technology for characterization and conservation of local landraces and indigenous crop seeds is relatively new. The open source digital platform for landraces (OSDPL) is an example of application of digital technologies in this domain (IGI Global, 2020). The OSDPL is a web application which allows not only the creation and storage of data pertaining to local landraces and indigenous crop seeds but also offers different other services such as seed profiling and data analysis. The major advantage of OSDPL is the ease of retrieving the data quickly, and ready availability of automatically generated reports for use.

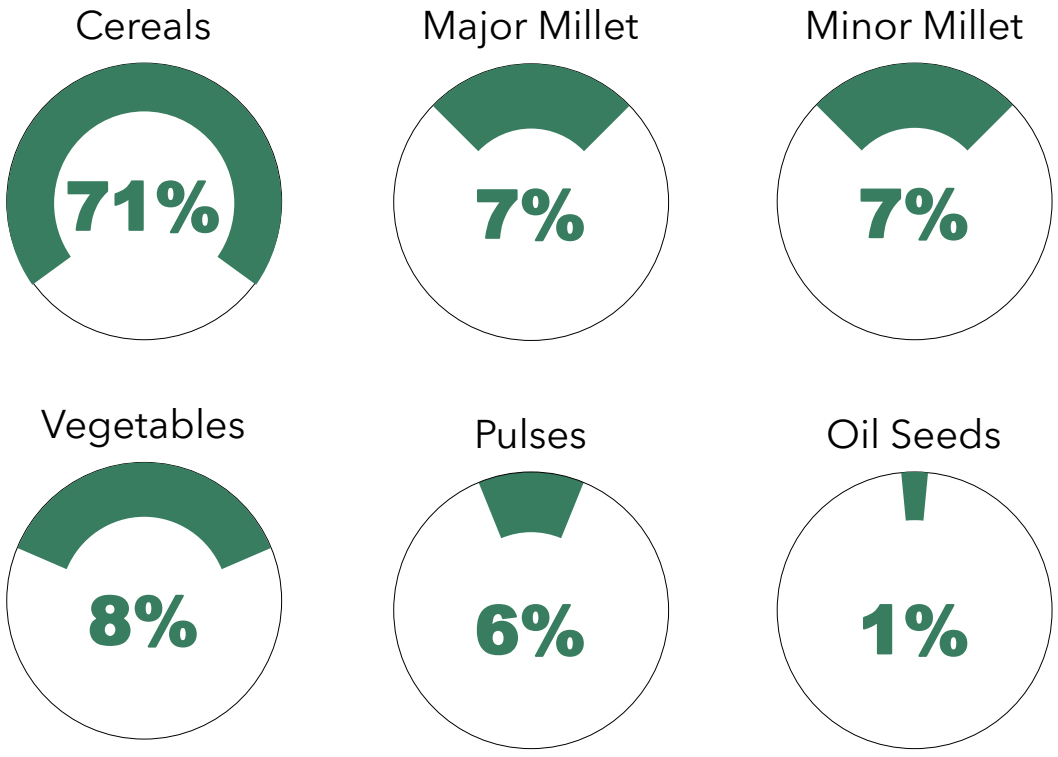
Seed repository systems are not new, the Ministry of Agriculture (MoA) and farmers cooperation, Government of India, has initiated the *"National Initiative for Information on Quality Seed" (NIIQS),* (GoI, 2020; GoI, nd). The objective of the NIIQS is to generate and provide data and information pertaining to the breeder seeds, foundation seeds, certified seed production, seed certification, publishes progress reports of seed testing laboratories and database of notified seed varieties. Similar to the government of India, the private seed production companies have their own seed repositories. However, both the public and private systems are predominantly focused on improved varieties and hybrids and seldom feature the indigenous crops seeds and local landraces. Further, both the systems have either partially or completely alienated the farmers and local communities from research and development associated with seed production. In this context the Watershed Support Services and Activities Network (WASSAN) has initiated OSDPL to bring people and technology together. The main objective of OSDPL (a people-technology partnership) is the promotion of community-based, participatory identification and characterization of the indigenous crop seeds and local landraces, participatory data generation and analysis, conservation and popularization of the local landraces and indigenous crop seeds, and increased accessibility of data and information to the public.

2. What is OSDPL?

OSDPL is a web-based digital repository for profiling, storing and analysing the data pertaining to indigenous crop seeds/ local landraces. It enables digitally inventorying the characterized data generated on the field through Crop diversity blocks/ participatory varietal trials. Data is generated through community participation under in-situ conditions also Characterization of the indigenous crop seeds/ local landraces is carried out by adopting a simplified Distinctness, Uniformity and Stability (DUS) test. Data and information thus generated is fed into the web-based digital repository managed by WASSAN and made available to the public. Information related to the primary source (nucleus seed) of a particular seed variety is available to the public. The inbuilt analytical tool checks and eliminates duplicates, as duplicity is one of the major challenges with indigenous crop seeds/ local landraces. It is often the case that the same indigenous crop seeds/ local landraces have many local /vernacular names but similar characteristics.

3. Participatory Characterization and *in-situ* Conservation of Indigenous Corp Seeds

Data of the morphological and genetic characteristics of 341 landraces of 34 crops was collected with community participation were trained by Community level resource persons during the year 2019-20 (*Figure – 1*). Data collection tools/ traits were designed based on the crop guidelines and DUS-Guidelines prescribed by the Protection of Plant Varieties and Farmers Rights (PPV&FR) Authority, India, for characterization and data collection (GoI, 2005).



Figure–1: Characterization done for various crops in the year 2019-20

Local seeds were collected through organizing the seeds mela's, farmers have brought different crop seeds through mela. For all the seeds accession numbers were given. Two replications of each accession have taken up in biodiversity block / participatory varietal trails. Five plants are randomly selected from each and labelled as p1, p2, p3, p4 and p5 (p: plant) bed for the purpose of data collection and analysis. Collection of at least five plants from each bed gives a better mean. Data pertaining to the crop type, seed variety, plant characters, stage of observation and type of assessment is provided in the table 1.

Table 1 - Format used for characterization of landraces of Foxtail millets

S. No.	Character	Status	Stage of observations	Type of Assessment ★
1 (*)(+)	Plant: Growth habit	Erect Decumbent Prostrate	04	VG
2	Leaf: Colour	Light Green Green Dark green Yellow Purple Deep purple	26	VG
3 (*)	Plant: Pigmentation at auricle	Absent Present	54	VG
4 (+)	Leaf: Attitude	Erect Droopy	54	VG
5	Leaf Sheath: Pubescence	Absent Present	54	VG
6	Leaf sheath: Intensity of Pubescence	Low Medium High	54	VG
7	Leaf Blade: Pubescence	Absent Present	54	VG
8 (+)	Flag leaf: Blade length(cm)	Short(<20) Medium (20-35) Long (>35)	54	MS
9 (+)	Flag leaf: Blade width (cm)	Narrow(<1.5) Medium(1.5-3.0) Wide(>3.0)	54	MS
10 (*)(+)	Days to 50% flowering	Early (<40)	54	MG
11 (*)(+)	Inflorescence: Shape	Oblong Pyramidal Cylindrical	54	VG
12 (*)(+)	Inflorescence: Bristles	Absent Present	54	VG

★ MG : Measurement by a single observation of a group of plants or parts of plants
MS : Measurement of a number of individual plants or parts of plants
VG : Visual assessment by a single observation of a group of plants or parts of plants
VS : Visual assessment by observation of individual plants or parts of plants

S. No.	Character	Status	Stage of observations	Type of
13 (*) (+)	Inflorescence: Length of bristles	Short	54	VG
		Medium		
		Long		
14 (+)	Peduncle: Length (cm)	Short (<20)	54	MS
		Medium (20.0-30)		
		Long (30.1-40)		
		Very long (>40)		
15 (+)	Inflorescence: Apical sterility	Absent	67	VG
		Present		
16 (*) (+)	Inflorescence: Compactness	Lax	67	VG
		Medium		
		Compact		
17 (+)	Inflorescence: Lobes	Absent	67	VG
		Present		
18 (+)	Plant: Height at maturity (cm)	Short (<80)	83	MS
		Medium (80.0-120)		
		Tall (>120)		
		Low (<4)		
19	Number of Productive tillers per plant	Moderate(4.0-8)	83	MS
		Profuse(>8)		
20 (+)	Earhead: Length (cm)	Short (<10)	83	MS/MG
		Medium (10.0-15.0)		
		Long (>15)		
		Whitish (RHS NO 161C)		
		Yellow (RHS NO 163C)		
21 (*)	Seed: Colour	Brown (RHS NO 187B)	83	VG
		Orange (RHS NO N172C)		
		Black (RHS NO 203 A)		
22 (*)	Seed: Shape	Elliptical	95	VG
		Oval		
23 (*)	1000 grain weight (g)	Low(<2)	95	MG
		Medium(2.0-4)		
		High(>4)		

Decimal code for the Growth Stage

Stage code	General Description
04	Seedling
15	2-4 Leaf stage
26	Vegetative
54	Flowering
67	Dough stage
77	Seed filling
83	Maturity
87	Harvest
95	After harvest

★

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4. Stage of Observation

It varies from crop to crop. I.e. dough stage, flowering stage, maturity stage, harvesting stage, etc.

5. Conclusion

The advantage of OSDPL is generation and availability of data pertaining to the indigenous crop seeds and local landraces to the public. A web-based repository enables the public/Civil Society Organisations (CSO's) / government / researchers corporations, etc. easily access the information. OSDPL takes the advantage of the internet and creates virtual seed banks. Such virtual seed banks can be accessed from anywhere and anytime and learn about the availability of seeds, location of a particular germplasm, available quantity, learn about the unique and special characteristics of the seed, etc. OSDPL increases transparency, promotes community participation in seed research and development, bridges the gap between producer and consumer, safeguards farmers rights and sovereignty, popularizes the indigenous crops and local landraces, and contributes to conservation of the unique germplasm.

OSDPL helps in data cleaning and profiling of local landraces in a more organized and efficient way as the inbuilt features of the systems can detect duplicates very efficiently and organize the data accordingly. However, there is still scope to improve the system, such as the addition of an option to upload pictures for easy identification of characters of a plant at different stages.

6. References

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