

## END OF PROJECT REPORT

### Socio-Economic Assessment of Agronomic Practices amongst Adopters and Non-Adopters of Pod Borer Resistant (PBR) Cowpea Farmers in Some Selected Agro-Ecological Zone of Nigeria

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#### **1 Introduction**

Cowpea (*Vigna unguiculata* (L.) Walp), is one of the most important grain legumes which contributes significantly to the livelihoods of millions of people in sub-Saharan Africa (SSA). Despite the importance of the crop, cowpea production is affected by constraints, which include insect pests, diseases, parasitic weeds (*Striga* and *Alectra*), and low soil fertility. To ameliorate these numerous challenges to cowpea production, breeders are continuously harnessing the potentials of modern genetics and advance breeding techniques to develop genetically superior lines adapted to most of the target production regions. The outcome of the vigorous research is the development and release of a Pod Borer Resistant cowpea (SAMPEA-20-T) popularly known as PBR Cowpea. The variety was developed through a combination of modern technique (genetic engineering) and modified conventional breeding techniques. SAMPEA-20-T variety possesses a transgene coding for the expression of the *CryIAb* protein with insecticidal effect against the Legume Pod Borer (LPB). This helps to reduce the rate of insecticide spray on PBR cowpea as compared to a conventional one.

Following the release of the new variety, it was promoted to farmers along with recommended agronomic practices. Therefore, as a follow-up socio-economic survey, there is the to assess the agronomic practices adopted and used by PBR cowpea farmers as against conventional cowpea farmers. The following questions were addressed:

#### **2. Study Research Questions**

- i. Are farmers adhering to the recommended field practices when introducing PBR cowpea?
- ii. How do adopters compare to non-adopters after introduction, with respect to practices and results?

#### **3 Methodological approach**

Four zones were used for the study, viz; Sahel, Sudan, Northern Guinea and Southern Guinea savannah zones. In each of Sahel, Sudan, Northern and Southern Guinea Savanna zones, two groups each consisting of 20 PBR and 20 conventional cowpea farmers respectively were randomly selected for the survey. This gave a total of 80 PBR farmers and 80 non-PBR farmers across the four ecological zones surveyed.

A Team consisting of two socio-economics experts (Supervisors) were responsible for the survey with the assistance of well-trained enumerators. The team adopted a digital questionnaire as data collection tool (designed using Open Data Kit-ODK Collect) to ensure good quality data. Enumerators were trained on how to use the Application before the inception of the data collection phase in the field.

A pre-test survey of the questionnaire was carried out with 10 selected PBR farmers and 10 non-PBR farmers each from close by communities. The pre-test was helpful in knowing the ease with which the responses provide the required reliable information and identifying faulty questions and statements in the draft. Thus, necessary additions, deletions, modifications and adjustments were made in the questionnaire on the basis of experiences gained from the pre-test.

Data were collected from the zones from late October to late December, 2022. Data was subjected for analysis with STATA 16.0 statistical package. Results of the analysis are as presented below.

#### **4. Adoption of PBR Recommended Management Practices by PBR Cowpea Farmers in four Ecological Zones of Nigeria.**

The result of the adoption of PBR recommended management practices by PBR farmers in the study area is presented in Table 1. The result reveals that 40% of PBR farmers adopted the recommended seed treatment management practices in the Sahel region, 55% in Sudan, 80% in Northern Guinea, and 70% in Southern Guinea region. The result indicates that Northern Guinea had the highest number of users for recommended seed treatment, while the least were from Sahel. From the pooled results, 61% of PBR farmers adopted the recommended seed treatment in the sampled zones.

Majority of PBR farmers adopted recommended land preparations practices across the four zones i.e. 90%, 80%, 85% and 90% for Sahel, Sudan, Northern Guinea and Southern Guinea Respectively. The pooled result for adoption was 86%. There were similar trends across the four zones for adoption of recommended seed rate (pooled = 86%) and sowing time (pooled = 88%) as was obtained for land recommendations. For the two practices, adoption was however more in Northern (seed rate = 95%; sowing time = 95%) and Southern Guinea (seed rate = 90%; sowing time = 95%) Zones when compared to Sahel (seed rate = 75%; sowing time = 85%) and Sudan (seed rate = 85%; sowing time = 75%) Savannas. The result could either

**Table 1: Adoption of PBR Recommended Management Practices by PBR Farmers**

Recommended management practices	Sahel		Sudan		Northern Guinea		Southern Guinea		Pooled	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Seed treatment:	8	40	11	55	16	80	14	70	49	61
Land preparations	18	90	16	80	17	85	18	90	69	86
Seed rate (kg/ha): 20 – 25 kg/ha	15	75	17	85	19	95	18	90	69	86
Sowing time	17	85	15	75	19	95	19	95	70	88
Spacing Between rows:	9	45	11	55	8	40	10	50	38	48
Thinning (Required at 2 WAS if manually planted with more than 2 plants per hill).	2	10	4	20	3	15	6	30	15	19
Fertilizer application (50kg Bag/ha)	3	15	2	10	4	20	7	35	16	20
Weed Management:	8	40	10	50	7	35	9	45	34	43
Pests and Diseases Management: Spray regimes: 2 times (At vegetative and flowering stage)	13	65	15	75	17	85	16	80	61	76
Maturity:	17	85	15	75	19	95	19	95	70	88
Harvesting/Threshing:	20	100	20	100	20	100	20	100	80	100
Bagging/Storage:	3	15	5	25	8	40	6	30	22	28

imply that farmers in NG and SG are more willing to adopt these technologies or awareness creation is more in the areas or both. The result of the recommended spray regimes for pests and diseases was high (pooled = 76%) amongst the farmers but in comparison across zones, it was higher in NG (85%) and SG (80%) as against Sahel (65%) and Sudan (75%).

It was however recorded that the adoption of some recommended practices by PBR farmers was low in the zones as less than half of the farmers adopted the practices. The rate of adoption of the practices with low scores for the pooled farmers were 48%, 43%, 28%, 20% and 19% for row spacing, weed management, triple bagging, fertilizer application and thinning respectively. Further, there was not much variation among the zones sampled as all zones recorded relatively low zones for the practices. This could call for increase in awareness creation on these practices as they are critical for cowpea production.

## 5. Comparative Analysis of PBR Farmers and Non-PBR Farmers with Respect to Practices

The results for the comparative analysis of PBR farmers and non-PBR farmers is presented in Table 2. The results reveal that PBR Farmers from Sahel, Sudan, Northern Guinea and Southern Guinea used seed treatment practice (61%) more than the non-PBR farmers who

represent only 5%. This implies that majority of farmers who used PBR seed adopted treatment technology in relation to the farmers that used conventional seeds. Likewise, while 86% of PBR farmers applied the recommended seed rate, only 20% non-PBR farmers used the recommended practice. Conversely, there was high percentage of both groups in the use of recommended land preparations practice (86% PBR farmers and 68% non-PBR farmers). This shows that majority of the farmers who planted PBR applied the introduced technology. This implies that majority of PBR practiced farmers adopted the recommended seed rate in relation to conventional farmers.

From the results, it was observed that there was a high compliance to sowing time for both PBR and non-PBR farmers across all zones though slightly higher for PBR farmers (88%) than non-PBR farmers (78%). There was also high adherence to use of recommended maturity date and harvesting and threshing technique by the two categories of farmers across the zones. About 88% and 64% of PBR and non-PBR farmers respectively allowed their cowpea to reach the recommended maturity period of 70 – 90 days before harvest. On further enquiry, PBR farmers that they harvest earlier as the crop matures earlier than the recommended period while non-PBR farmers harvest later than recommended period as conventional cowpea takes longer to mature. Compliance to recommended harvesting and threshing technique for PBR farmers was 100% and 80% for non-PBR farmers.

Conversely, the compliance with the use of some recommended practices (spacing, thinning, fertilizer rate, weed management, pest disease management and bagging/storage) was low for both groups except for pest and disease management (76%) with PBR farmers. Pest and disease management was high for PBR farmers. The rates were lower for non-PBR farmers when compared to PBR farmers for the recommended practices listed in the parenthesis above except for the thinning process probably because they did not adhere to recommended seed rate. Specifically, farmers who used PBR applied the recommended spacing between rows method (48%) more than the conventional cowpea farmers (3%) in the four ecological zones. Similarly, 43% of PBR adopters applied the recommended weed management practice, while only 6% non-PBR farmers followed the method. For recommended practice of bagging and storage, 28% of the PBR farmers adopted bagging and storage recommended practice, while only 8% non-PBR farmers considered the practice, indicating that PBR farmers were more involved in the practice. For thinning practice, 19% of PBR farmers applied the recommended practice as against a higher value of 33% for non-PBR farmers.

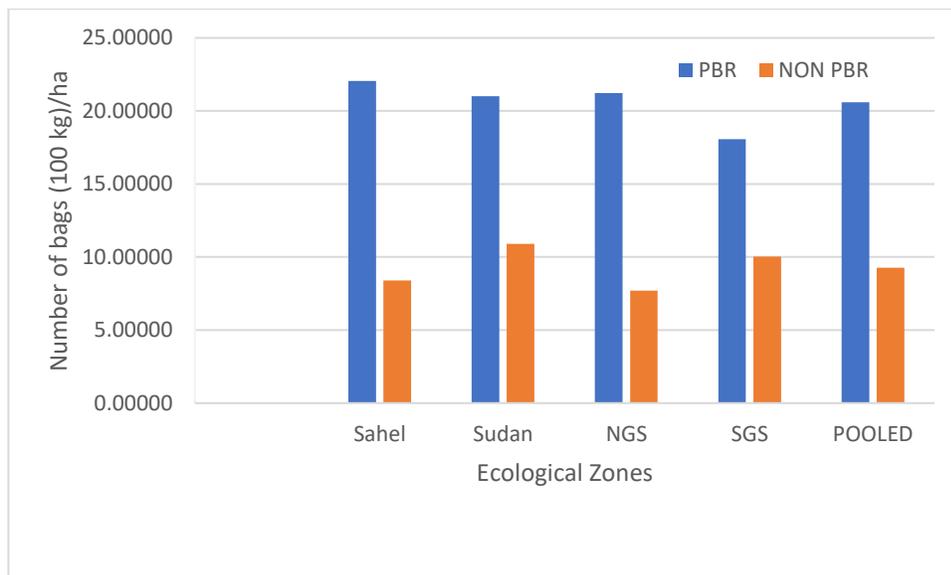
**Table 2:** Comparative Analysis of PBR Farmers and Non-PBR Farmers with respect to Practices

Agro-ecology Recommended crop management practices	Sahel				Sudan				Northern Guinea				Southern Guinea				Pooled			
	PBR Farmers		Non-PBR Farmers		PBR Farmers		Non-PBR Farmers		PBR Farmers		Non-PBR Farmers		PBR Farmers		Non-PBR Farmers		PBR Farmers		Non-PBR Farmers	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Seed treatment:	8	10	1	5	11	55	0	0	16	80	2	10	14	70	1	5	49	61	4	5
Land preparations	18	90	15	75	16	80	14	70	17	85	13	65	18	90	12	60	69	86	54	68
Seed rate (kg/ha): 20 – 25 kg/ha	15	75	3	15	17	85	4	20	19	95	5	25	18	90	4	20	69	86	16	20
Sowing time	17	85	15	75	15	75	14	70	19	95	17	85	19	95	16	80	70	88	62	78
Spacing Between rows:	9	45	0	0	11	55	0	0	8	40	1	5	10	50	1	5	38	48	2	3
Thinning	2	10	5	25	4	20	6	30	3	15	7	35	6	30	8	40	15	19	26	33
Fertilizer application (50kg Bag/ha)	3	15	0	0	2	10	0	0	4	20	0	0	7	35	0	0	16	20	0	0
Weed Management:	8	40	1	5	10	50	1	5	7	35	1	5	9	45	2	10	34	43	5	6
Pests and Diseases Management:	13	65	4	20	15	75	6	30	17	85	7	35	16	80	7	35	61	76	24	30
Maturity:	17	85	13	65	15	75	12	60	19	95	14	70	19	95	12	60	70	88	51	64
Harvesting/Threshing:	20	100	16	80	20	100	17	85	20	100	15	75	20	100	16	80	80	100	64	80
Bagging/Storage:	3	15	1	5	5	25	1	5	8	40	2	10	6	30	2	10	22	28	6	8

## 6. Comparative Analysis of PBR Farmers and Non-PBR Farmers with Respect to Yield

Figure 1 below shows the yield obtained by PBR and non-PBR farmers from the four zones and when pooled. There was a general higher yield obtained by PBR farmers as against non-PBR farmers from the four zones. Sahel, Sudan and Northern Guinea zones had average yield of PBR cowpea slightly above 2 tons per hectare while SG zone was slightly below 2 tons. When all the zones were pooled together, the was about two tons for PBR. For non-PBR however, the yields for the zones were far lower than what was obtained for PBR. Only Sudan zone had yield slightly above 1 ton per hectare as the others were either at 1 ton or below. When all the zones were pooled the average yield stood at about 0.9 ton per hectare.

For further comparison, the average yields for PBR and non-PBR of each zone were subjected to a Z-test to ascertain whether there was significant difference or not in the yields obtained by the two groups. The results in Table 3 show that there were high significant differences among the groups in the four zones as all t-values were significant at 1% level of probability. The difference was also significant for the pooled result.



**Table 3: T-test Results of Yields from PBR and non-PBR farmers in Four Ecological Zones and the Pooled**

<b>PAIRED VARIABLES</b>	<b>Mean Difference</b>	<b>Std. Deviation</b>	<b>Std. Error Mean</b>	<b>T - value</b>
<b>PBR SAHEL - NPBR SAHEL</b>	13.642456	7.628158	1.705708	7.998
<b>PBR SUDAN - NPBR SUDAN</b>	10.109223	6.955501	1.555297	6.500
<b>PBR NG - NPBR NG</b>	13.522478	7.548017	1.687788	8.012
<b>PBR SG - NPBR SG</b>	8.046862	7.316684	1.636060	4.918
<b>PBR POOLED – NPBR POOLED</b>	11.33025	7.60819	.85062	13.320

### **Conclusion**

The rate of adoption of recommended practices by PBR farmers was fair considering the time frame the practices were introduced to the farmers but there is room for improvement. The adoption varied according to practice, high for some but low for others. The adoption of the practices however was higher for PBR farmers as compared to non-PBR farmers. There was also a resultant higher yield obtained by the PBR farmers.

### **Acknowledgement**

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