MINISTRY OF FOOD AND AGRICULTURE

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West Africa Food System Resilience Program

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PROTOCOLS

FOR ESTABLISHING COMMUNITY FIELD DEMONSTRATIONS FOR LOWLAND RICE IN THE SOUTHERN, MIDDLE AND NORTHERN BELTS OF GHANA

MINISTRY OF FOOD & AGRICULTURE
REPUBLIC OF GHANA

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DIRECTORATE OF AGRICULTURAL EXTENSION SERVICES.

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PROTOCOLS FOR ESTABLISHING COMMUNITY FIELD DEMONSTRATIONS FOR LOWLAND RICE IN THE SOUTHERN, MIDDLE AND NORTHERN BELTS OF GHANA

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1. MAIN OBJECTIVE

To increase productivity by enhancing farmers' knowledge of improved rice varieties and climate-smart technologies.

2. SITE SELECTION

- All sites should be easily accessible for ease of crop monitoring, data collection, and farmer training.
- The soil should be clayey-loam, which is suitable for rice cultivation.
- The soil at the selected site should have good water-holding capacity.
- The selected site should be fairly flat.
- A dedicated or lead farmer's field should be selected

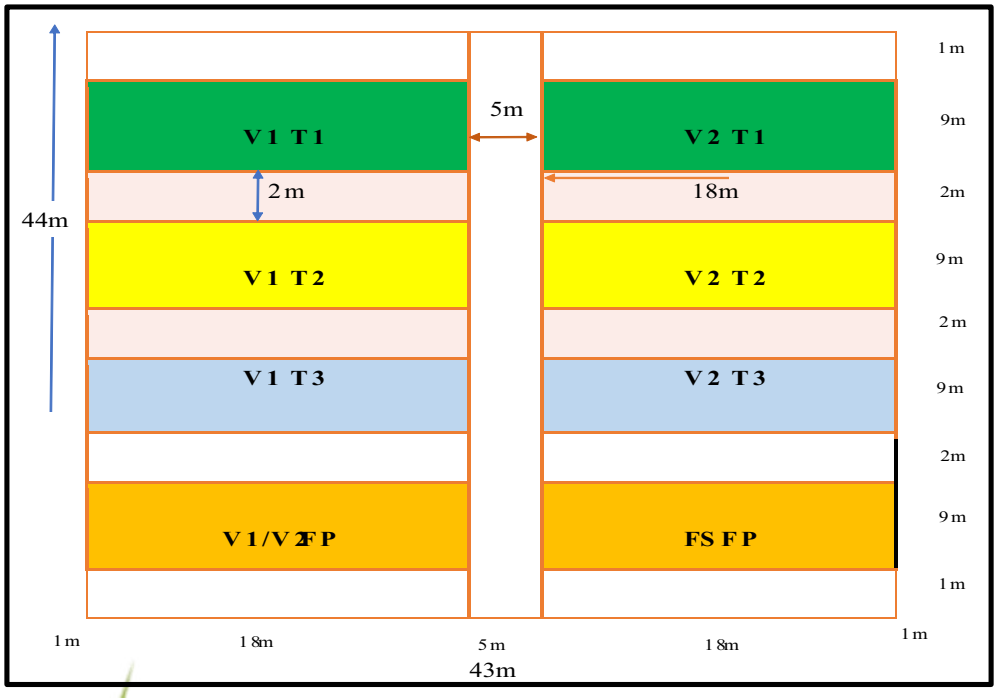
Table 1:
Target Locations for the Establishment of Rice Demonstrations.

No.	Community/Location	District	Region	Varieties
1		Asante Akim North	Ashanti	
2		Atwima Kwanwoma	Ashanti	
3		Atwima Nwabiagya	Ashanti	
4		Atwima Nwabiagya North	Ashanti	
5		Ejisu	Ashanti	
6		Ejura	Ashanti	
7		Juaben	Ashanti	
8		Kumasi	Ashanti	
9		Kwabre East	Ashanti	
10		Mampong	Ashanti	
11		Offinso	Ashanti	
12		Offinso North	Ashanti	
13		Sekyere Afram Plains	Ashanti	
14		Sekyere Central	Ashanti	
15		Sekyere East	Ashanti	
16		Sekyere South	Ashanti	
17		Berekum West	Bono	
18		Dormaa Central	Bono	
19		Dormaa East	Bono	
20		Dormaa West	Bono	
21		Sunyani	Bono	
22		Sunyani West	Bono	
23		Kintampo North	Bono East	
24		Nkoranza South	Bono East	
25		Techiman	Bono East	
26		Awutu Senya West	Central	
27		Gomoa Central	Central	
28		Gomoa East	Central	
29		Kwahu East	Eastern	
30		Kwahu West	Eastern	
31		Lower Manya Krobo	Eastern	
32		New Juaben North	Eastern	
33		Nsawam-Adoagyiri	Eastern	
34		Okere	Eastern	
35		Ningo-Prampram	Greater Accra	
36		Shai-Osudoku	Greater Accra	
37		East Mamprusi	North East	
38		Mamprugu Moagduri	North East	
39		West Mamprusi	North East	
40		Gushiegu	Northern	
41		Karaga	Northern	

3. LAND PREPARATION

- Clear the land and remove debris
- Plough, harrow and level the plots
- Create/repair bunds and canals
- Apply approved herbicide
- Perform first and second rotavation
- Incorporate biochar at a rate of 120 kg/plot during the second rotavation on selected full rate biochar plots
- In the case of where organic amendment is required, apply 60 kg of organic fertilizer/compost/poultry manure in addition to the 60 kg of biochar per plot immediately after the second rotavation.

4. FIELD LAYOUT (PLOT DEMARCATION)



4.1 Illustration: Field Layout – Major and/ Minor Season

- Divide the land into demonstration plots
- Each plot should measure 9m x 18m
- Leave 1 m alley around the entire field, 5m alley between blocks (different varieties), (within the 5m alley use 1m for canal,1m for 2 bunds construction each apart and 1 m buffer zone) 2m alley between plots (same varieties) to prevent biases, help farmers move around the demos.

Parameter	Value
Number of plots	8 (including farmer fields)
Overall length	44 m
Overall width	43 m
Length per plot (Row length)	18 m
Width per plot (Row width)	9 m
Total area per plot	162 sq. meters
Number of rows in a plot	45 rows
Number of plants within rows	90 stands
Plant population per plot	4050 stands
Spacing between rows	20 cm
Spacing within rows	20 cm

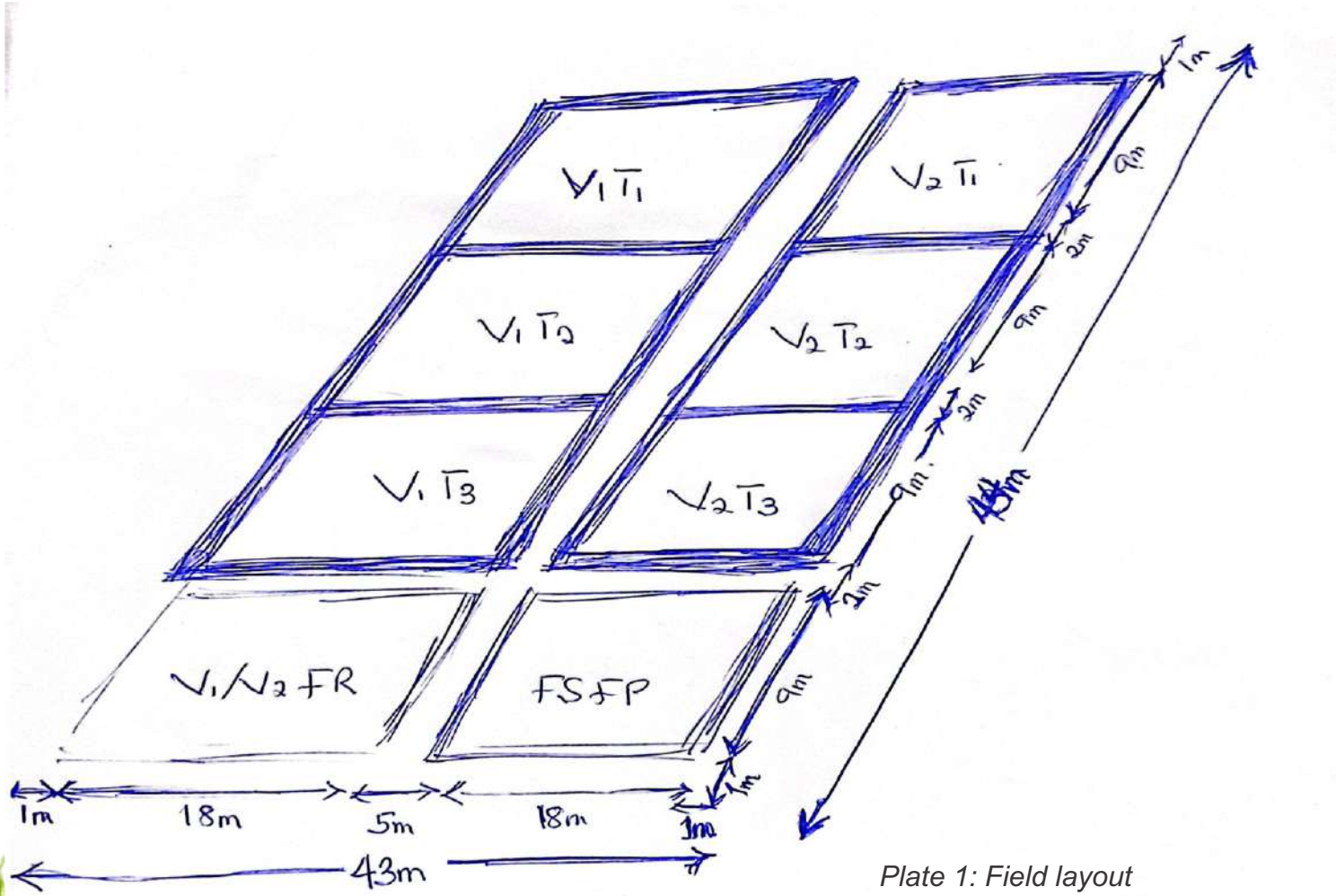


Plate 1: Field layout

5. SEED RATE: 50 kg/ha

Table 2: Seed Requirement for the Northern belt

Practice	Variety	Seed rate (kg/plot)		
		2.5 kg	2.5 kg	2.5 kg
Practice 1	Legon Rice 1 (V1)	Biochar + ½ rate of inorganic (T1)	½ rate of b iochar + ½ inorganic + ½ organic (T2)	Full rate of inorganic (T3)
Practice 2	CRI -Agyapa (V2)	Biochar + ½ rate of inorganic (T1)	½ rate of b iochar + ½ inorganic + ½ organic (T2)	Full rate of inorganic (T3)
Practice 3 (Farmer practice)	Farmer's Seed (FS)	Farmer practice	Farmer practice	Farmer practice

Total number of plots per demo= 7.
Quantity of seed required per demo=15 kg (V1 and V2) plus 2.5 kg of either V1 or V2
V1= 7.5 kg plus 2.5 kg (either preferred by farmer)
V2= 7.5 kg plus 2.5 kg (either preferred by farmer)
FS=Farmer's Seed,
FP= Farmer's Practice (2.5 kg for Farmer's plot)

Table 3: Seed requirement for the Middle belt

Practice	Variety	Seed rate (kg/plot)		
		2.5 kg	2.5 kg	2.5 kg
Practice 1	CRI -Agyapa (V1)	Biochar + ½ rate of inorganic (T1)	½ rate of biochar + ½ inorganic + ½ organic (T2)	Full rate of inorganic (T3)
Practice 2	CRI -Enapa (V2)	Biochar + ½ rate of inorganic (T1)	½ rate of biochar + ½ inorganic + ½ organic (T2)	Full rate of inorganic (T3)
Practice 3 (Farmer practice)	Farmer's Seed (FS)	Farmer practice	Farmer practice	Farmer practice

Total number of plots per demo= 7.
Quantity of seed required per demo=15 kg (V1 and V2) plus 2.5 kg of either V1 or V2
V1= 7.5 kg plus 2.5 kg (either preferred by farmer)
V2= 7.5 kg plus 2.5 kg (either preferred by farmer)
FS=Farmer's Seed,
FP= Farmer's Practice (2.5 kg for Farmer's plot)

Table 4: Seed requirement for the Southern belt

Practice	Variety	Seed rate (kg/plot)		
		2.5 kg	2.5 kg	2.5 kg
Practice 1	Banse (V1)	Biochar + ½ rate of inorganic (T1)	½ rate of biochar + ½ inorganic + ½ organic (T2)	Full rate of inorganic (T3)
Practice 2	CRI -Agyapa (V2)	Biochar + ½ rate of inorganic (T1)	½ rate of biochar + ½ inorganic + ½ organic (T2)	Full rate of inorganic (T3)
Practice 3 (Farmer practice)	Farmer's Seed (FS)	Farmer practice	Farmer practice	Farmer practice

Total number of plots per demo= 7.
Quantity of seed required per demo=15 kg (V1 and V2) plus 2.5 kg of either V1 or V2
V1= 7.5 kg plus 2.5 kg (either preferred by farmer)
V2= 7.5 kg plus 2.5 kg (either preferred by farmer)
FS=Farmer's Seed,
FP= Farmer's Practice (2.5 kg for Farmer's plot)

6. NURSERY ESTABLISHMENT

- Obtain good-quality and certified seeds from recognized seed producers or dealers.
- Select a good site which is accessible.
- Prepare nursery beds with dimensions of about 1 m wide, 2 m long and 15 cm high.
- Treat beds with recommended pesticide.
- Maintain furrows around the seedbed to hold water to avoid frequent watering.
- Pre-germinate seeds (treatment) by soaking in water for 24 hrs.
- Broadcast your primed seeds on the nursery bed within 24 to 48 hrs.
- Cover the seeds with topsoil and palm fronds or grass.
- Water the seed bed in the mornings and evenings or as and when necessary.
- Remove the cover after one week and continue watering until it is ready for transplanting.

7. TRANSPLANTING

• Minimize root damage and shock of seedlings by watering the nursery bed before uprooting for transplanting.

• Use an uprooter to uproot the rice seedlings and transplant them onto the plots.

• Transplant at 1 seedling/hill within 14-21 days after sowing.

• Transplant in rows at a spacing of 20 cm x 20 cm.

• Perform refiling 10 days after transplanting when necessary.

8. WATER MANAGEMENT

• Maintain maximum water levels to avoid drought, which may affect growth.

• Apply alternate wetting and drying (AWD) if necessary.

• Drain and refill water if water becomes contaminated (especially iron toxicity).

9. WEED CONTROL

•Keep fields free of weeds.

•Use recommended herbicides to control weeds.

•Apply hand-picking of weeds if necessary.

•Maintain high water levels to suppress weed growth.

•Remove off-types (rogueing) at least twice (during the vegetative stage and the flowering stage).

Figure 1**: Rogueing of rice field at Dawhenya Irrigation Scheme.* ***Source: *CSIR-CRI*

10. PESTS AND DISEASES CONTROL

Major Rice Pests

1. Stem Borer

• Spray with Imidacloprid-based insecticides such as K-Optimal or other recommended insecticide etc.

• Spray with Chlopyriphos ethyl-based products such as Dursban, Conpyrofos etc.

• Spray with Acetamaprid-based products such as Golan 20SP at a rate of 8 ml/ 20 L Knapsack sprayer.

Figure 2: Damage caused by rice stem borers

2. Mole Cricket

Figure 3: Mole cricket

· Flood the field for 3-4 days, ensuring an equal level of water on the field.

· Use tolerant varieties.

· Ensure proper land preparation, especially during tillage.

· Collect nymphs and adults during land preparation

3.Rice Gall Midge

· Use biological control agents if available. Eg. Platygaster oryzae, eupelmid, pteromalid wasp, spiders etc.

· Plough immediately after harvesting and remove all debris.

· Spray recommended bio-pesticide

Figure 4: Rice gall midge

Figure 5: Damage caused by rice gall midge

4. Birds

• Use of nets around the field to prevent birds from having access to seeds.

• Use “Bird scarers” to drive away birds.

• Use a noisemaker to scare birds away.

• Use scarecrows, flags or bird kites to scare away birds.

• Use decoy birds to attract or repel birds on the farm.

• Use recommended bird repellents (eg AV 5055) to repel birds from the farm

Figure 6: Scare crows to scare away birds

11. RICE DISEASES

1. Rice Yellow Mottle Disease (RYMD)

• Control the main vector of the disease (beetles) by spraying with the recommended pesticide.

• Remove and burn affected plants.

• Fallow infected field for at least one season to break the disease cycle.

• Remove alternate hosts of the disease, such as weedy rice.

• Use tolerant varieties.

Figure 7: An RYMV infested rice field at Asotwe the Ashanti Region of Ghana. Source: CSIR-CRI

2. Rice Blast Disease

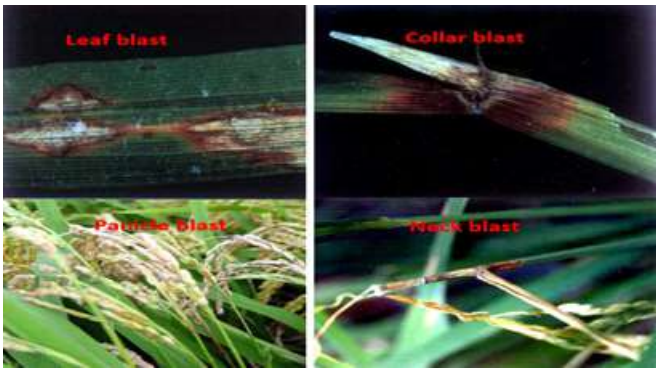


Figure 6: Symptoms of rice blast disease

• Treat seeds before planting using fungicides such as soaking seeds in a 0.2% solution of Kalimat B for 24 hours before planting.

• Spray with recommended fungicides such as Bordeaux mixture before and after flowering.

• By reducing excessive nitrogen application.

3. Rice False Smut Disease

Figure 7: Symptoms of false smut on panicles

- Spray with carbendazim or copper-based fungicide before flowering.
- Spray with 0.4 % Bordeaux Mixture when the plants are about three weeks' old.
- Practice proper farm sanitation

4. Sheath Rot

- Reduce planting density from 20 cm x 20 cm to 25 cm x 25 cm on infected fields.
- Remove infected plants from the field.
- Practice good farm sanitation, including control of weeds.
- Application of fertilizers containing Potassium, Calcium and Zinc at tillering stage to strengthen the culms.

Symptoms of sheath rot on rice panicle

Figure 8: Symptoms of sheath rot on rice panicle

12. FERTILIZER APPLICATION

Basal

- Apply basal NPK soon after transplanting at a rate of 2.42 kg/plot for V1T2 and V2T2, and 4.83 kg/plot for V1T1 and V2T1 as first split ,
- Broadcast fertilizer evenly on the field surface.
- Maintain water level at the barest minimum during fertilizer application.
- Practice alternate wetting and drying (AWD) after seedling establishment (to promote tillering).
- All P and K fertilizers and 50 % N fertilizers must be applied as basal.

Table 5: Fertilizer Application Rates for Lowland Rice Production

Treatment	Soil Practice	Quantity of fertilizer to apply (kg/plot)			
		Biochar	Compost	N: P: K 15:20:20 + Zn	Sulphate of Ammonia
V1T1	Biochar [1] + 1/2 inorganic fertilizer [2]	81.1	0	2.42	1.71
V1T2	½ rate of Biochar + Half inorganic + Half organic	40.5	40.5	2.42	1.71
V1T3	Full rate of inorganic fertilizer	0	0	4.83	3.48
V2T1	Biochar + Half rate inorganic fertilizer	81.1	0	2.42	1.71
V2T2	½ rate of Biochar + Half inorganic + Half organic	40.53	40.53	2.42	1.71
V2T3	Full rate of inorganic fertilizer	0	0	4.83	3.48
V1/V2 FP	Farmer Practice	-	-	-	-
FSFP	Farmer Practice	-	-	-	-

NB: Biochar[1]: The rate of biochar used is 5 t/ha
Full rate inorganic fertilizer[2]: The rate used is 90:60:60 N: P_2O_5: K_2O kg/ha + 1.7 kg/ha Zn

Top dressing

1. Apply sulphate of ammonia at a rate of
- 1.71 kg/plot for V1T1, V1T2, V2T1 and V2T2; and
- 3.48 kg/plot for V1T3 and V2T3 after maximum tillering at lowland. OR

2. Broadcast fertilizer evenly on the field.

3. Maintain about a 10 cm level of water, but do not flood the field.

4. With standing water, fertilizer can be applied at any time of the day.

5. NPK application 1-2 weeks after sowing.

6. SOA application 5-6 weeks after sowing.

Compost/ Organic Manure

Apply compost/organic manure on selected plots by broadcasting, followed by incorporation to 20 cm depth using a hoe at transplanting at a rate of 57 kg per plot (Practice 2).

12. HARVESTING

• Harvest at physiological maturity
(when 85% of panicles fully turn straw brown in colour)

• During harvesting, remove all panicles by use of sickle into a labelled sack and weigh.
• Dry seeds on a drying floor/dryer until the moisture content reaches 14%.

• Yield data to be collected or studies

Field Days

Field days	**Activity**
First Field Day	Nursery/ Transplanting
Second Field Day	Transplanting and Plot cutting
Third Field Day	Fertilization
Fourth Field Day	Harvesting and Yield Studies
Fifth Field Day	Sensory Analysis

General Information

1. Expectations

a.The Size of the demo must be achieved to be accepted as a demo

b.The host farmer must be ready and willing to invest in the demo (labour)

c.Demo plots shall be sited along the farmers' route

d.There should be a distance/alley between the demo plot and neighbouring farms

2. Responsibilities

2.1 Partner
a.Provides land for the demonstration
b.Takes care of land preparation
c.Takes care of field-sowing, fertilizer application, weeding, and harvesting

3.0 Project:
a.Other related costs (Inputs, meetings, incidentals)
b.Monitoring of Demo at various stages

3.1 Have a signpost showing:

- The treatment (s) being tested.....
- Contact information for inquiries about the demo.....

3.2 Demo Size: Half of an acre

3.3 Name of Partner .....

3.4 Name of Field Officer: .....

3.5 Name of Lead Farmer: ..... (Female/Male)

3.6 Region: ..... District: ..... Town: .....

3.7 GPS coordinates of demo plot: .....

3.8 Previous crop: .....

3.9 Please include weather data for the demo location, where available.

3.10 Record the sowing and harvesting dates, as well as the weight of the harvested paddy, in the tables provided below:

Sowing Date

Treatment	V1T1	V1T2	V2T3	V2T1	V2T2	V2T3	V1FP	FSFP
Sowing date								
Transplanting								

Harvesting Date

Treatment	V1T1	V1T2	V1T3	V2T1	V2T2	V2T3	V1FP	FSFP
Harvesting date								
Weight (sub -plot 1)								
Weight (sub -plot 2)								

4.0 General observations.....

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5.0 Data Collection Plan for Demonstration

Farmers' comments on technologies during field days/visits

S/No.	Name	Age (≥18)	Disabled		Gender		Assessment of Technology (Like or Dislike)	Reason for like or dislike
			Yes	No	M	F		
1.								
2.								
3..								
4.								
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