2011 年に導入された改良稲作技術 - 1/3

（出典　稲作技術専門家報告書）

種子選別	Ashanti 州の移植栽培を行う Trial Plot では、生育が健全で良好な苗を作るために、不稔籾、充実不足籾、病害籾などを除去する方法として塩水選別法を導入した。塩水の比重は生卵の浮揚程度で確認することとした。 Northern 州では全て直播栽培であるため、乾籾が播種されている。塩水選を行うと塩水を洗い落とす作業が発生して煩雑になるため普及の場面でネックとなる可能性があるが、真水による種子選別なら塩水選よりも受け入れやすいと考えられる。
種子予措	移植を行うサイトでは、苗代に播種する種子の準備として、鳩胸状態になるまで 3 日程度水に浸し、水から揚げたあとは数時間風乾するよう指導した。貯水に浸す場合は水替えを行うことも指導したが、一部では水替えが行われなかった。
育苗	Ashanti 州の移植栽培を行う Trial Plot では水苗代を推奨したが、実際には畑苗代を採用するサイトもあった。苗取り作業が雑に行われ、根が切れた苗を植えたために欠株や生育ムラが起こったと見られる圃場が散見された。苗取り作業を丁寧に行うようを指導するとともに、労力が軽減されるような方法を伝えていく必要がある。
畦造成（水管理）	Ashanti 州では従来、不耕起による稲栽培が一般的であったが、耕起することでその後の圃場管理がやりやすくなることや土壌中の有機物由来の窒素が有効化して稲に利用されやすくなるなどの利点があることから、Trial Plot では、耕起、代掻きを導入した。畦の造成は、生育に必要な水を確保し、圃場準備や移植等の作業を容易にし、施肥、雑草防除などの管理を確実に行うために天水稲作においても大変重要な技術である。畦を造成し湛水することで、田面の高低差が容易に判別できるので、均平作業のためにも畦の造成は有効であり、高低差が大きい場合には簡易な中畦を造成することでそれぞれの区画を均平に保つことも可能となる。2010 年は Ashanti 州内の全てのサイトで畦の造成が行われ、2011 年も同様に全サイトで畦の造成が行われた。これにより、水の確保と、稲の生育や管理作業に応じた水管理が可能となった。 Northern 州では、2010 年に畦を造成して表流水を圃場内に溜めることを推奨したが、水の重要性に対する意識付けが不足しているためか、畦を造成したのは Nachimbia と Sanga のサイトのみであった。2011 年は全てのサイトで畦が造成されたが、高低差が大きい圃場では高い部分に水が集まらず、作畦の効果が及んでいない。中畦を作り一筆内の高低差を小さくすることで水をより効果的に利用できるが、作畦の労力が増大する。耕起作業時に、トラクターを使って土を盛り上げて畦を造れば表面を叩き固める作業だけで済むので、トラクターを用いた作畦は省力的な技術となり得るが、トラクター作業が行われる期間は短く、需要が集中するので 1 圃場にかけることが出来る時間が限られる。農家とトラクターの所有者及びオペレーターに受け入れられるならば、作業料金を割り増しで支払い丁寧な耕起作業と作畦を依頼することも可能ではないかと考えられる。

2011 年に導入された改良稲作技術 - 2/3

（出典　稲作技術専門家報告書）

条植及び点播	条植は、単位面積あたりの株数や穂数を確保し、除草作業を効果的に実施するために必要な技術である。 Ashanti 州では 2010 年から、移植栽培を実施したサイトでは条植を行い、直播を実施したサイトでは点播を行った。Trial Plot では、2010 年、2011 年ともに従来の方法に比べて高収量を達成できたが、その主要な要因の一つは、条植、条播による効果的な除草と穂数の確保であったと考えられる。 Northern 州の Trial Plot では、圃場を 2 分割し直線点播と条播を行った。2010 年の観察では、条播の方が出芽速度が早く出芽率が高く、初期生育も優れていた。2011 年の観察では、点播区では欠株が多かったため、穂数不足となった可能性がある。直線点播と条播で収量性に差がなければ、作業量や作業時間の点から、条播の方が農家に受け入れやすい技術となる。今後は、播種作業軽減のために播種機による播種の導入も考える必要がある。
除草	Ashanti 州では 2010 年、2011 年ともに、移植を行ったサイトでは手押し除草機による除草を 2 回、直播を行った圃場では除草グワによる除草または除草剤散布を 2 回実施した。移植圃場では、適期に手押し除草機により 2 回の除草を行うことで、ほぼ完全に雑草を管理することが出来た。 Northern 州では、全圃場で直播栽培を行うため、雑草管理が栽培上の課題である。Trial Plot の作業では、グループ農家の参加の足並みが揃わず除草時期を逸したケースや除草剤散布時期、散布量、濃度、気象条件が不適切で剤の効果がなかったと考えられるケースが 2010 年、2011 年とも見られた。直播栽培では、除草剤のみに依存した除草では不十分であり、除草グワを用いた人力による適期除草が実際上不可欠である。除草剤の使用について、適正な使用方法を指導するとともに、圃場内の雑草の状況に応じた除草作業を遅れずに行うことの必要性を指導していく必要がある。
施肥	Ashanti 州と Northern 州では、稲作農家のそれぞれ 10%程度、40%程度が施肥を行っていると推定されるが、品種に応じた適正な施肥量や施肥時期に関する知識や情報の普及度は大変低いとみられる。 両州において 2010 年、2011 年両年とも、すべての Trial Plot で MOFA の推奨量(N-P-K)60-30-30kg/ha を施肥した。 2010 年は Northern 州では分げつ期及び幼穂形成期に、Ashanti 州では、分げつ期及び幼穂形成期に施肥を行うサイトと分げつ期及び穂ばらみ期に施肥を行うサイトに分けた。Ashanti 州で最高収量を達成した Mpasatia サイトでは、分げつ期及び穂ばらみ期分施であった。Northern 州では、2010 年はいずれのサイトでも生育は良好であったが、収量は期待したほどに伸びなかった。供試品種が収量ポテンシャルが高くない Digan であったことに起因すると考えられる。 2011 年は、穂数の確保、籾数の確保、登熟歩合の向上と籾重増加を目的として、施肥時期を 4 回に分けた。それぞれの施肥時期の施用量とねらい(効果)は表の通りである。施肥時期を 4 回に分けると労働時間が増加するので、施肥を 4 回に分けることの意味を農家が理解しておく必要がある。新たに稲作を担当する DDO、AEA に対する研修では、分施の目的や意味を十分に理解できるよう知識と情報の伝達を行う。

2011 年に導入された改良稲作技術 - 3/3

（出典　稲作技術専門家報告書）

<table>
<tr><td>施肥</td><td colspan="3">トライアル・プロットの施肥量（2011）</td></tr>
<tr><td></td><td>施肥時期</td><td>施肥量　（成分量）</td><td>効果</td></tr>
<tr><td></td><td>移植後 2 週間目(移植)</td><td rowspan="2">N:30kg/ha、P30kg/ha、K30kg/ha</td><td>穂数確保</td></tr>
<tr><td></td><td>播種後 3 週間目(直播)</td><td></td></tr>
<tr><td></td><td>1 回目施肥の 2 週間後</td><td>N:15kg/ha
((N:21% NH4(SO4)2</td><td>穂数確保</td></tr>
<tr><td></td><td>出穂前 20～18 日頃</td><td>N:10kg/ha
(N:21% NH4(SO4)2)</td><td>籾数確保</td></tr>
<tr><td></td><td>穂ばらみ期</td><td>N:　5kg/ha
(N:21% NH4(SO4)2)</td><td>登熟歩合向上籾重増加</td></tr>
<tr><td></td><td colspan="3">※N 回目は Sulfan (N:24%)を施用</td></tr>
<tr><td>適期収穫</td><td colspan="3">収穫の時期は、収穫物の品質を左右する重要な要因の一つである。研究機関のデータによれば Jasmin85 および Digan の生育期間は 115 日であり、2010 年はその情報と籾の登熟程度を勘案して収穫日を決定した。直播時期が遅れた AshantiPraso サイトでは生育後期が乾季に入り、生育と籾の成熟程度から判断して収穫を行った結果、播種後 98 日目の収穫と、2 週間以上の短縮となったが、4t/ha の収量を達成した。この結果は、Jasmin85 の環境適応能力が高いことを示唆している。
2011 年は各 District に穀粒水分測定器を配布したため、AEA が現場で籾水分を測定できるようになった。籾水分が 25～20%になった時点で収穫可能であると指導したが、20%以下での収穫となったサイトもあった。Ashanti 州では概ね刈遅れによる過乾燥はなかった。Northern 州では、同様に籾水分をモニターしていたが、刈遅れや収穫後の過乾燥で全体に籾水分が低い傾向であった。
穀粒水分測定器を配布したことで、籾水分を確かめながら収穫期を決めることが出来るようになったが、今後、対象面積が拡大すると全ての圃場で水分測定が出来るわけではないので、AEA が計測値（籾水分）と籾の状態（熟色、固さなど）を関連づけて理解し、水分計測器がなくてもおよその籾水分を判断し、収穫適期を農家に伝えることが出来るようになる必要がある。次作期以降は、この点も AEA 対象の研修、指導項目に加える。</td></tr>
</table>

Status of Trial Plots (Land Development) 1/2

Ashanti Region

	DISTRICT	COMMUNITY		2010 major season Planted Y	2010 major season Planted N	2010 major season Land Leveling Bunding Harvesting water L	2010 major season Land Leveling Bunding Harvesting water B	2010 major season Land Leveling Bunding Harvesting water H	2011 Major season Planted Y	2011 Major season Planted N	2011 Major season Land Leveling Bunding Harvesting water L	2011 Major season Land Leveling Bunding Harvesting water B	2011 Major season Land Leveling Bunding Harvesting water H	2011 Minor season Planted Y	2011 Minor season Planted N	2011 Minor season Land Leveling Bunding Harvesting water r L	2011 Minor season Land Leveling Bunding Harvesting water r B	2011 Minor season Land Leveling Bunding Harvesting water r H	R:Land Reclamation (from a virgin land) I: Land Improvement (from an existing land)	Water source	Type of water use (tentative)
Ashanti Region	Asante Akim North	Akutuase	1	○		○	○	×	○		○	○	×						I	Submerged area, knee level	Bunds only
			2 middle						○		○	○	×						I	ditto	Bunds only
			3 separate						○		○	○	×						I	ditto	bunds only
		Atonsu	1 old	○		○	○	×	○		×	×	○						I	surface water, flood affected area	N.A
			2 right, road						○		×	×	×						R	ditto	N.A
			3 left, road						○		×	×	×						R	ditto	N.A
	Ahafo Ano North	Katabo	French M	○		○	○	○	○		○	○	○	○		○	○	○	I+R	gentle surface water	WUDPC
			Central						○		○	○	○	○		○	○	○	I+R	ditto	WUDPC
			Market	○		○	○	×	○		○	○	○	○		○	○	○	R	ditto	WUDPC
		Anyinasuo	1 (Sumaila)	○		○	○	○	○		○	○	○						I	Existing canal use like irrigation	WUDPC
			2 Road side						○		○	○	○			○	○	○	R	surface water + runoff water	WUDC
			3 cocoa						○		○	○	○			○	○	○	R	surface water	WUDPC
	Atwima Mponua	Mpasatia	1 top	○		○	○	○	○		○	○	○	○		○	○	○	R	surface water, flood affected area	WUDC
			2 middle						○		○	○	○	○		○	○	○	R	ditto	WUDPC
			3 down						○		○	○	○	○		○	○	○	R	ditto	WUDPC
		Kansakrom	1 road	○		×	○	○	○		○	○	○						R	surface water + runoff	RWUS
			2 middle						○		○	○	○						R	ditto	RWUS
			3 down						○		○	○	○						R	ditto	RWUS
	Adansi South	Subriso	1 old		×	○	○	○	○		×	○	○						I+R	surface + runoff water	RWUNS
			2 top						○		○	○	○						I+R	ditto	RWUNS
			3 road side						○		×	×	×						R	rainwater	N.A

		Praso	1 old, road	○		×	×	×	○		×	×	×						I		surface water	N.A
			2 middle						○		◯	×	×						I		ditto	N.A
			3 Gariba						○		○	○	◯						R		backwater affected area(Pra river)	WUDPC
Targeted		8 communities (9 trial plots)		9					24										R	13 sites		
Actually established out of 9 trial plots				8	1				24	0									I+R	4 sites		
LD technology applied						7/9	8/9	5/9			18/24	18/24	16/24						I	7 sites		

Type of water use (tentative)
WUDC: Water use with Divided-canal type
WUDPC: Water use with dual purpose canal type
RWUS: Runoff water use with structure
RWUNS: Runoff water use with no structure

Status of Trial Plots (Land Development) 2/2

Northern Region

	DISTRICT	COMMUNITY		2010 Major season				2011 Major season				2011 Minor season				**R**:Land Reclamation (from a virgin land) **I:** Land Improvement (from an existing land)	Water source	Type of water use (tentative)
				planted	**L**and Leveling **B**unding **H**arvesting water			planted	**L**and Leveling **B**unding **H**arvesting water			planted	**L**and Leveling **B**unding **H**arvesting water					
					L	B	H		L	B	H		L	B	H			
Northern Region	Tamale Metro	Nachimbiya	Tibobamsi (G1)	○	×	○	×	○	×	○	×	not applicable (dry season)				I	runoff water + rain water	surface water
			Suglo Konbon (G2)					○	×	○	×					I	runoff water + rain water	ditto
			Gubli Nye yaa(G3)					○	×	○	×					I	runoff water + rain water	ditto
		Sanga	Bobgu Veilla (G1)	○	×	○	×	○	×	○	×					I	runoff water + rain water	ditto
			Suglo Nburibuni (G3)					○	×	○	×					I	runoff water + rain water	ditto
			G2					×	-	-	-					-	-	
	West Mamprusi	Gbimsi	Tiimarisuigu (G1)	○	×	×	×	○	×	○	×					I	runoff water + rain water	ditto
			Badimsuguru (G2)					○	×	○	×					I	runoff water + rain water	ditto
			Dintige (G3)					○	×	○	×					I	runoff water + rain water	ditto
		Wungu	Tinsungtaaba (G1)	○	×	○	×	○	×	○	×					R+I	runoff water + rain water	ditto
			Kpanmenga (G2)					○	×	○	×					R+I	runoff water + rain water	ditto
			Tidoliba (G3)					○	×	○	×					R+I	runoff water + rain water	ditto
	East Gonja	Kpalbe	Wunzalgu (G1)	○	×	×	×	○	×	○	×					I	runoff water + rain water	ditto
			Zaapayin (G2)					○	×	○	×					R	runoff water + rain water	ditto
			after old					×	-	-	-					-	-	
		Gbung	Yebo Biyooda (G1)	○	×	×	×	○	×	○	×					I	runoff water + rain water	ditto
			G2					×	-	-	-					-	-	
			G3					×	-	-	-					-	-	
Targeted		6 communities		6				18								R 1/14		
Actually established				6				14								R+I 3/14		
LD technology applied					0/6	3/6	0/6		0/14	14/14	0/14					I 10/14		

５．アシャンティ州・ノーザン州対象地の地形・水文条件の特徴

(Geographical and Hydrological features between the Ashanti Region and the Northern Region)

	Ashanti	Northern	Remarks
1. Available water resources	Rainfall/springs/stream	Rainfall	
2. Potential for water resources development	Marginally suitable for Dam, diversion weir construction so on.	Unsuitable	Due to topographic condition
3. Precipitation and pattern	Annual precipitation: 1307mm - 1928mm 1st rainy season: Apr-Jul: 636-876mm No. of days with rainfall 30-41days/69-97days a year 2nd rainy season: Aug-Nov: 509-848mm 30-40 days/69-97days a year	Annual precipitation: 1091mm-1145mm Rainy season June-Sept:714mm-735mm No. of days with rainfall: 57-59days out of 97 days a year	Possible two rice rotation in the AR
4. Evapotranspiration	Lower evapotranspiration levels	Higher evapotranspiration due to high solar energy and vegetation	Figures is not yet confirmed
5. Runoff situation	Surface + subsurface WL: knee Retain: 2-5 days	Surface WL: knee to waist level Retain: 1-3 days	NR: Like a flash flood
	・ Overflow from rivers or streams ・ Natural backwater	Inundation at low land area (at water way)	
6. Stream flow characteristics	・ Gentle and uniform flow (seasonal during rainy season and permanent through the year) ・ Stream order: after 2nd -order stream	・ Flood flash flow (flow during rain) ・ Stream order: 1st-oreder stream	-By Strahler's stream order
7. Landscape's physical characteristics	Slope of land: gentle Side slope: Steep/gentle	Slope of land: Flat pain Side slope: little gentle slopes	
8. Land use for rice cultivation	Use rotational and shifting cultivation	Continuous land use/cultivation	
9. Soil physical properties (series, depth, fertility)	Very dark grayish brown silty loam soils which are suitable for agriculture	Brown sandy clay soils on narrow valley bottoms. Good agricultural soils	
10. Plot size	Less than 1 acre	More than 1 acre	
11. Configuration at on-farm level	-10 to +20cm	-20 to +30cm	
12. Means of land preparation	・ By hand (no plowing, no harrowing) ・ dibbling/broadcasting	・ By tractor (plowing, harrowing) ・ Broadcasting	
13. Water borne diseases	Eelworm, leech	Guinea worm	
14. Vegetation	Dense forest	Savannah with short trees, shrubs and grasses	

Results of Questionnaire Survey on Technical Package of Improved Rain-fed Lowland Rice Production: Northern Region - 1/3

Northern Region - 1/3

	Respondent				
	Northern Region				
	West Mampursi			East Gonja	
	DDA	AEA Wungu	AWA Gbimsi	DDA	DDO
Q1. Technology contributed **most** to productivity increase	land dev. rice cultivation	land dev.	land dev.	land dev. rice cultivation	land dev. rice cultivation
Q2. Technology contributed **most** to quality improvement	rice cultivation post-harvest technologies	rice cultivation	rice cultivation	rice cultivation post-harvest technologies	rice cultivation post-harvest technologies
Q3. Land development/preparation technologies:					
- Most contributed to yield increase	bund construction	bund construction	bund construction	land leveling	ploughing & harrowing
- 2nd most contributed to yield increase	land leveling	land leveling	land leveling	bund construction	bund construction
Q4. Rice cultivation technologies/practices:					
- Most contributed to yield increase	quality seed	quality seed	quality seed	quality seed (variety)	planting method (drilling & dibbling)
- 2nd most contributed to yield increase	fertilization	planting method (drilling, dibbling)	planting method (distance)	planting method	weeding & rouging
- 3rd most contributed to yield increase	planting method (distance)	fertilization (split dressing)	fertilization	timely weeding & fertilization	split fertilization
Q5. Element technology contributed to quality improvement					
- Most contributed to quality improvement	timely harvesting	rouging	rouging	proper weeding	rouging
- 2nd most contributed to quality improvement	rouging	timely harvesting	timely harvesting & threshing on tarpaulin	timely harvesting	timely harvesting & threshing on tarpaulin
Q6. Land development/preparation technologies					
- A. Element works/technologies easily adopted by farmers	bund construction	bund construction	bund construction	ploughing	ploughing & harrowing
- B. Element works/technologies not easily adopted by farmers	leveling	leveling	leveling	bund construction & leveling	bund construction
- Ideas to improve the adoption rates of B by farmers.	farmer training & demonstration	trial & demonstration, training	trial & demonstration	demonstration of technologies	
Q7. Rice cultivation technologies/practices					
- A. Element works/technologies easily adopted by farmers	roughing, row planting, fertilization	quality seed	seed selection & fertilization	improved variety, weed control, fertilization (timing)	fertilization
- B. Element works/technologies not easily adopted by farmers	bund construction, leveling, transplanting, germination test	fertilization	rouging	planting method (drilling), water control, split fertilization	drilling & dibbling
- Ideas to improve the adoption rates of B by farmers.	farmer training, demonstration & trial	trial & demonstration, training	use quality seed or rouging	demonstration of technologies farm credit	
Q8. Post-harvest technologies at farmer level					
- A. Element works/technologies easily adopted by farmers	threshing on tarpaulin	timely harvesting	drying & threshing		harvesting with sickle threshing on tarpaulin
- B. Element works/technologies not easily adopted by farmers	timely harvesting	tarpaulin use for threshing	timely harvesting	rouging, timely harvesting, threshing on tarpaulin, harvesting with sickles	
- Ideas to improve the adoption rates of B by farmers.	farmer training & demonstration on quality improvement	trial & demonstration, training	quality improvement demonstration	farmer training & capacity building	
Q9. Whether having sufficient technical knowledge and skills to provide proper guidance	not sufficient	not sufficient	not sufficient	not sufficient	not sufficient
If not sufficient, training subjects you should have to enhance your capability to provide proper guidance?	land development & rice production	land development & rice production	land development	site selection, land preparation, bund construction, variety selection, critical growth stage, nutrient & water management, rice processing	training on rice cultivation techniques, post harvest technologies & refresher training on LD
Q10. Opinions and suggestions for the development, field applicatio and dissemination/extension of the "Technical Package of Improved Rain-fed Lowland Rice Production" in the project areas and regions	supervision & monitoring to be enhanced staff motivation	timely provision of inputs to farmers training of C/Ps sufficient fuel supply to C/Ps	C/Ps & farmers to have sufficient capacity on land dev. provision of quality seed timing of operation to be observed	establish trial plot as centers for learning & supporting farmer group of 10 members at most FFD & study tour for farmers in & outside of target community	simple tool or equipment for line planting

Q1. Technology components which contributed **most** to productivity increase in trial plots
Q2. Technology components which contributed **most** to quality improvement in trial plots
Q3. Land development technologies: Element technology most, 2nd most & 3rd most contributed to yield increase of rice among the element works of land development/preparation
Q4. Rice cultivation technologies/practices: Element technology most, & 2nd most contributed to yield increase of rice among the element works of land development/preparation
Q5. Element technology most and 2nd most contributed to quality improvement of rice
Q6. Land development/preparation technologies
- A. Element works/technologies which are easily adopted by farmers
- B. Element works/technologies which are not easily adopted by farmers
- Ideas to improve the adoption rates of B by farmers.

Q7. Rice cultivation technologies/practices
- A. Element works/technologies which are easily adopted by farmers
- B. Element works/technologies which are not easily adopted by farmers
- Ideas to improve the adoption rates of B by farmers.

Q8. Post-harvest technologies at farmer level
- A. Element works/technologies which are easily adopted by farmers
- B. Element works/technologies which are not easily adopted by farmers
- Ideas to improve the adoption rates of B by farmers.

Q9. Whether having sufficient technical knowledge and skills to provide proper guidance on "Technical Package" for providing guidance to AEAs and farmers?

If not sufficient, what kind of training and training subjects you should have to enhance your capability to provide proper guidance?

Q 10. Opinions and suggestions for the development, field application and dissemination/extension of the "Technical Package of Improved Rain-fed Lowland Rice Production" in the project areas and regions.

Results of Questionnaire Survey on Technical Package of Improved Rain-fed Lowland Rice Production: Northern Region - 2/3

Northern Region - 2/3

Inquiry	Respondent: Northern Region – East Gonja: AEA Gbung	Tamale Metro: DDA	Tamale Metro: DDO	Tamale Metro: AEA Sanga	Tamale Metro: AEA Nachimbiya
Q1. Technology contributed **most** to productivity increase	rice cultivation	rice cultivation	land dev. rice cultivation	rice cultivation	rice cultivation
Q2. Technology contributed **most** to quality improvement	post-harvest technologies	rice cultivation	rice cultivation post-harvest technologies	post-harvest technologies	post-harvest technologies
Q3. Land development/preparation technologies:					
- Most contributed to yield increase	ploughing & harrowing	bund construction	land leveling	land leveling	land leveling
- 2nd most contributed to yield increase	land leveling	land leveling	bund construction	bund construction	
Q4. Rice cultivation technologies/practices:					
- Most contributed to yield increase	planting method	planting method	planting method	planting method	planting method, weeding
- 2nd most contributed to yield increase	quality seed	fertilization (split)	fertilization (split)	fertilization (timing)	fertilization (timing/method)
- 3rd most contributed to yield increase	fertilization	weeding (timely)	timely harvesting	weeding (timely)	quality seed
Q5. Element technology contributed to quality improvement					
- Most contributed to quality improvement	timely harvesting	weeding & rouging	quality seed	weeding	weeding, rouging
- 2nd most contributed to quality improvement	rouging	timely harvesting	rouging	rouging	timely harvesting
Q6. Land development/preparation technologies					
- A. Element works/technologies easily adopted by farmers	bund construction	ploughing & harrowing	ploughing & harrowing	land leveling	ploughing & harrowing
- B. Element works/technologies not easily adopted by farmers	leveling	bund construction	bund construction	bund construction	bund construction
- Ideas to improve the adoption rates of B by farmers.	more technical knowledge & equipment for leveling	farmer training	land development by gov.	awareness creation of farmers	awareness creation of farmers
Q7. Rice cultivation technologies/practices					
- A. Element works/technologies easily adopted by farmers	drilling & dibbling	planting method, leveling	drilling	land leveling	planting method/timely weeding
- B. Element works/technologies not easily adopted by farmers	fertilization, leveling	bund construction split fertilization	dibbling fertilization	bund construction	fertilization rouging
- Ideas to improve the adoption rates of B by farmers.	demonstration of technologies	use of machinery training on effect of split fertilization	small planter	training on effect of bunds	awareness creation of farmers
Q8. Post-harvest technologies at farmer level					
- A. Element works/technologies easily adopted by farmers	rouging	timely harvesting	timely harvesting	timely harvesting	timely harvesting, use of tarpaulin
- B. Element works/technologies not easily adopted by farmers	timely harvesting	timely threshing on tarpaulin	threshing on tarpaulin	timely threshing	timely threshing, storage & packaging
- Ideas to improve the adoption rates of B by farmers.	scale down of field size	training small combine harvester	small combine harvester	awareness creation of pre-harvest loss	farmer training
Q9. Whether having sufficient technical knowledge and skills to provide proper guidance	sufficient	sufficient	sufficient		
If not sufficient, training subjects you should have to enhance your capability to provide proper guidance?		refresher training & field visit	refresher training on post harvest technologies		
Q10. Opinions and suggestions for the development, field application and dissemination/extension of the "Technical Package of Improved Rain-fed Lowland Rice Production" in the project areas and regions	provision of farming fund in time for commencement of rain	motivation to AEAs farmer training to alter their mind-set	more fund for farmer training monitoring fund for supervisors		

Q1. Technology components which contributed **most** to productivity increase in trial plots
Q2. Technology components which contributed **most** to quality improvement in trial plots
Q3. Land development technologies: Element technology most, 2nd most & 3rd most contributed to yield increase of rice among the element works of land development/preparation
Q4. Rice cultivation technologies/practices: Element technology most, & 2nd most contributed to yield increase of rice among the element works of land development/preparation
Q5. Element technology most and 2nd most contributed to quality improvement of rice
Q6. Land development/preparation technologies
- A. Element works/technologies which are easily adopted by farmers
- B. Element works/technologies which are not easily adopted by farmers
- Ideas to improve the adoption rates of B by farmers.

Q7. Rice cultivation technologies/practices
- A. Element works/technologies which are easily adopted by farmers
- B. Element works/technologies which are not easily adopted by farmers
- Ideas to improve the adoption rates of B by farmers.

Q8. Post-harvest technologies at farmer level
- A. Element works/technologies which are easily adopted by farmers
- B. Element works/technologies which are not easily adopted by farmers
- Ideas to improve the adoption rates of B by farmers.

Q9. Whether having sufficient technical knowledge and skills to provide proper guidance on "Technical Package" for providing guidance to AEAs and farmers?

If not sufficient, what kind of training and training subjects you should have to enhance your capability to provide proper guidance?

Q 10. Opinions and suggestions for the development, field application and dissemination/extension of the "Technical Package of Improved Rain-fed Lowland Rice Production" in the project areas and regions.

Results of Questionnaire Survey on Technical Package of Improved Rain-fed Lowland Rice Production: Northern Region - 3/3

Northern Region - 3/3

Inquiry	Respondent: Northern Region: Regional C/Ps: RCP 1 (extension)	RCP 2 (rice cultivation)	RCP 3 (farming support system)	Summary
Q1. Technology contributed **most** to productivity increase	land dev. rice cultivation	rice cultivation	rice cultivation	rice cultivation (11/18), land dev. (7/18)
Q2. Technology contributed **most** to quality improvement	rice cultivation post-harvest technologies	rice cultivation	post-harvest technologies	rice cultivation (9/18), post-harvest technologies. (9/18)
Q3. Land development/preparation technologies:				
- Most contributed to yield increase	ploughing & harrowing	bund construction	contort ploughing	ploughing & leveling (8/13), bund construction (5/13)
- 2nd most contributed to yield increase	bund construction	contort ploughing	bund construction	bund construction (6/13), ploughing & leveling (6/12),
Q4. Rice cultivation technologies/practices:				
- Most contributed to yield increase	planting method, quality seed	planting method	quality seed	planting method (8/15), seed quality (6/15), other 1/15)
- 2nd most contributed to yield increase	fertilization (split)	quality seed	planting method (spacing)	fertilization (6/13), planting method (4/13), seed quality (2/13), other (1/13)
- 3rd most contributed to yield increase	planting method	weeding	weeding	fertilization (5/13), weeding (5/13), planting method (2/13), seed quality (1/13)
Q5. Element technology contributed to quality improvement				
- Most contributed to quality improvement	rouging	quality seed	rouging	weeding (9/13), fertilization (2/13), seed quality (2/13)
- 2nd most contributed to quality improvement	timely harvesting & threshing	rouging	post harvest handling	harvesting (7/16), rouging (5/16), post-harvest technologies (4/16)
Q6. Land development/preparation technologies				
- A. Element works/technologies easily adopted by farmers	ploughing & harrowing	ploughing & harrowing	ploughing & harrowing	ploughing & leveling (9/13), bund construction (4/13)
- B. Element works/technologies not easily adopted by farmers	water control, weeding	bund construction, water control	bund construction	bund construction (8/16), ploughing & leveling (5/16), others (3/16)
- Ideas to improve the adoption rates of B by farmers.	machinery bund construction	simple mechanization	field tours to properly bunded fields	training & demonstration (9/13), mechanization (3/13)
Q7. Rice cultivation technologies/practices				
- A. Element works/technologies easily adopted by farmers	quality seed, drilling	quality seed, drilling	planting method (line)	planting method (8/22), seed quality (5/22), fertilization (4/22)
- B. Element works/technologies not easily adopted by farmers	line planting, timely harvesting & threshing	dibbling	bund construction	planting method (6/18), fertilization (6/18), rouging (2/18), others (4/18)
- Ideas to improve the adoption rates of B by farmers.	farmer field days & tour	simple mechanization of dibbling		training (8/14), mechanization (3/14), others (3/14)
Q8. Post-harvest technologies at farmer level				
- A. Element works/technologies easily adopted by farmers	threshing using clean material	threshing on tarpaulin	timely harvesting	harvesting (7/14), post-harvest technologies (5/14), others (2/14)
- B. Element works/technologies not easily adopted by farmers	timely harvesting	timely weeding & bund construction	early threshing (after harvesting)	post-harvest technologies (7/15), harvesting (5/15), others (3/15)
- Ideas to improve the adoption rates of B by farmers.		simple mechanization of dibbling	farmer training on timely threshing & harvesting	training (8/12), harvester (2/12), others (2/12)
Q9. Whether having sufficient technical knowledge and skills to provide proper guidance	sufficient	sufficient	sufficient	sufficient (6/11), not sufficient (5/11)
If not sufficient, training subjects you should have to enhance your capability to provide proper guidance?	merit of early harvesting	rice morphology & growth characteristics		rice cultivation (5/14), land dev. (4/14), refresher training (3/14)
Q10. Opinions and suggestions for the development, field application and dissemination/extension of the "Technical Package of Improved Rain-fed Lowland Rice Production" in the project areas and regions	more trial plots more FFD & field tours	mobilization of C/Ps sensitizing farmers on low cost agronomic practices	farmer training on land preparation, input application, post harvest technologies & scheduled farming	

Q1. Technology components which contributed **most** to productivity increase in trial plots
Q2. Technology components which contributed **most** to quality improvement in trial plots
Q3. Land development technologies: Element technology most, 2nd most & 3rd most contributed to yield increase of rice among the element works of land development/preparation
Q4. Rice cultivation technologies/practices: Element technology most, & 2nd most contributed to yield increase of rice among the element works of land development/preparation
Q5. Element technology most and 2nd most contributed to quality improvement of rice
Q6. Land development/preparation technologies
- A. Element works/technologies which are easily adopted by farmers
- B. Element works/technologies which are not easily adopted by farmers
- Ideas to improve the adoption rates of B by farmers.

Q7. Rice cultivation technologies/practices
- A. Element works/technologies which are easily adopted by farmers
- B. Element works/technologies which are not easily adopted by farmers
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Q8. Post-harvest technologies at farmer level
- A. Element works/technologies which are easily adopted by farmers
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Q9. Whether having sufficient technical knowledge and skills to provide proper guidance on "Technical Package" for providing guidance to AEAs and farmers?
If not sufficient, what kind of training and training subjects you should have to enhance your capability to provide proper guidance?
Q 10. Opinions and suggestions for the development, field application and dissemination/extension of the "Technical Package of Improved Rain-fed Lowland Rice Production" in the project areas and regions.

ヘクタール当たりの推定稲作収益の予備的検討結果 1/

項目	単価	トライアル・プロット											
		アシャンティ州： 移植						アシャンティ州： 直播					
		量	価格	量	価格	量	価格	量	価格	量	価格	量	価格
生産量（ton/ha）		4.0		5.0		6.0		3.0		4.0		5.0	
単価（GH/ton）	1,190												
粗収益（GH/ha）			**4,760**		**5,950**		**7,140**		**3,570**		**4,760**		**5,950**
生産費（GH/ha）			**841**		**871**		**894**		**842**		**917**		**947**
生産資材費（GH/ha）			*367*		*379*		*390*		*482*		*527*		*539*
種子（kg/ha）	2.0	30	60	30	60	30	60	60	120	60	120	60	120
肥料（kg/ha）			195		195		195		195		195		195
NPK (15-15-15)	0.60	200	120	200	120	200	120	200	120	200	120	200	120
硫安	0.50	150	75	150	75	150	75	150	75	150	75	150	75
Sulfan	0.58												
農薬（lt/ha） 2/	10.0							10	100	10	100	10	100
その他			112		124		135		67		112		124
労賃（GH/ha）			*474*		*492*		*504*		*360*		*390*		*408*
家族労働（人日）		79		81		84		60		65		67	
雇用労働（人日） 3/	6.0	79	474	82	492	84	504	60	360	65	390	68	408
労働計（人日）		158		163		168		120		130		135	
純収益（GH/ha）			**3,919**		**5,079**		**6,246**		**2,728**		**3,843**		**5,003**
純収益/粗収益（%）			82		85		87		76		81		84

項目	単価	トライアル・プロット						ベースライン調査結果 6/					
		ノーザン州： 直播						ア州： 移植		ア州： 直播		ノーザン州：直播	
		量	価格	量	価格	量	価格	量	価格	量	価格	量	価格
生産量（ton/ha）		3.0		3.5		4.0		2.4		1.15		1.15	
単価（GH/ton） 4/	595 & 1,190												
粗収益（GH/ha）			**1,785**		**2,083**		**2,380**		**2,856**		**1,369**		**684**
生産費（GH/ha）			**603**		**613**		**627**		**551**		**683**		**498**
生産資材費（GH/ha）			*527*		*533*		*539*		*353*		***603***		***430***
種子（kg/ha）	2.0	63	126	63	126	63	126						
肥料（kg/ha）			193		193		193						
NPK (15-15-15)	0.60	200	120	200	120	200	120						
硫安	0.50												
Sulfan	0.58	125	73	125	73	125	73						
農薬（lt/ha） 2/	10.0	10	100	10	100	10	100						
その他			108		114		120						
労賃（GH/ha）			*76*		*80*		*88*		*198*		*80*		*68*
家族労働（人日）		44		48		51		77		48		38	
雇用労働（人日） 5/	4.0 & 6.0	19	76	20	80	22	88	33	198	20	80	17	68
労働計（人日）		63		68		73		110		68		55	
純収益（GH/ha）			**1,183**		**1,471**		**1,754**		**2,305**		**686**		**186**
純収益/粗収益（%）			66		71		74		81		50		27

1/: 営農分析短期専門家報告書をもとに算定;トライアル・プロットでは収量レベルにかかわらず生産資材費（種子、肥料、農薬）は同じと仮定　　2/: 10lt/ha と仮定
3/: 全労働投入量の50%を雇用労働と仮定　　4/: ノーザン州 595GH/ton 、アシャンティ州 1,190GH/ton　　5/: 全労働投入量の30%を雇用労働と仮定、ノ州 4.0GH/人日、ア州 6.0GH/人日
6/: プロジェクトで実施したベースライン調査結果（2009年）

MINUTES OF MEETINGS
ON
JAPANESE TECHNICAL COOPERATION FOR
THE PROJECT FOR SUSTAINABLE DEVELOPMENT OF
RAIN-FED LOWLAND RICE PRODUCTION
IN THE REPUBLIC OF GHANA

The Joint Mid-term Review Team (hereinafter referred to as "the Team"), engaged by Japan International Cooperation Agency (hereinafter referred to as "JICA") and Ministry of Food and Agriculure (hereinafterr reffered to as "MOFA") conducted the Joint Mid-term Review of the Project for Sustainable Development of Rain-fed Lowland Rice Production (hereinafter referred to as "the Project") in the Republic of Ghana from 24th January to 10th February 2012.

The Team was headed by Mr. Koichi Kito, Senior Representative of JICA Ghana Office and Mr. A. R .Z Salifu, Deputy Director, Directorate of Crop Service, MOFA.

During the period of Review, the Team had series of discussions with the concerned authorities and jointly reviewed the achievement of the Project with respect to project performance using five evaluation criteria.

As a result of the discussions, the Team and the authorities of Republic of Ghana agreed on the details referred to in the document attached hereto.

Accra, 17th February, 2012

木藤 耕一

Mr. Koichi Kito
Leader
Joint Mid-term Review Team
Japan International Cooperation Agency
Japan

Mr. Maurice Tanco Abisa-Seidu
Chief Director
Ministry of Food and Agriculture
Republic of Ghana

Joint Mid-term Review Report

on

The Project for Sustainable Development of Rain-fed Lowland Rice Production in the Republic of Ghana

CONTENTS

Abbreviations and Acronyms

Abbreviation	Name
AEA	Agricultural Extension Agent
ADB	Agricultural Development Bank
AED	Directorate of Agriculture Extension
AFD	Agence Francaise de Developement
AfDB	African Development Bank
AGRA	Alliance for a Green Revolution in Africa
AVRDC	Asian Vegetable Research and Development Center
CARD	Coalition for African Rice Development
CF	Contact Farmer
CGIAR	Consultative Group on International Agricultural Research
C/P	Counterpart Personnel
CRI	Crops Research Institute
CSD	Crop Service Directorate
CSIR	Council for Scientific and Industrial Research
DADU	District Agriculture Development Unit
DDO	District Development Officers
FAO	Food and Agriculture Organization
FASDEP II	Food and Agriculture Sector Development Policy II
GF	Group Farmer
GIDA	Ghana Irrigation Development Authority
GPRS	Growth and Poverty Reduction Strategy
GRIB	Ghana Rice Inter-professional Body
GTZ	German Agency for Technical Cooperation
KF	Key Farmer
KR	Kennedy Round
IFAD	International Fund for Agricultural Development
JICA	Japan International Cooperation Agency
IRRI	International Rice Research Institute
IVRDP	Inland Valley Rice Development Project
IWMI	International Water Management Institute
JCC	Joint Coordinating Committee
JOCV	Japan Overseas Cooperation Volunteers
M/M	Minutes of Meeting
METASIP	Mid-term Agriculture Sector Investment Plan

Abbreviations and Acronyms (Continued)

MMDAs	Metropolitan Municipal and District Authorities
MOFA	Ministry of Food and Agriculture
MOFEP	Ministry of Finance and Economic Planning
MSE	Micro and Small Scale Enterprise
NFED	Non Formal Education Division
NRDS	National Rice Development Strategy
PCU	Project Coordination Unit
PDM	Project Design Matrix
PO	Plan of Operations
PPMED	Policy Planning, Monitoring and Evaluation Directorate
RADU	Regional Agriculture Development Unit
R/D	Record of Discussion
RSSP	Rice Sector Support Project
SARI	Savannah Agricultural Research Institute
SRI	Soil Research Institute
S/W	Scope of Work
TICAD	Tokyo International Conference on African Development
TOT	Training for Trainers

1. Introduction

1.1 Background and Objectives

Currently, rice consumption in urban areas in the Republic of Ghana has increased; meanwhile, supply of domestic rice is low. Hence, supply of rice depends much on importation which constitutes 60 to 70% of rice consumed in the nation. Thus, strengthening of domestic rice production and distribution system of the cereal with market competitiveness is an urgent and critical issue from the viewpoint of food security and saving foreign currency.

The Government of Ghana, therefore, requested the Japanese Government to lay down Master Plan for promotion of domestic rice industry. The Japanese side conducted "The Study on The Promotion of Domestic Rice in The Republic of Ghana" from June 2006 to March 2008 (hereafter the Study). The Study finally planned Integrated Development Program composed of plural development components, based on three (3) categorized rice farming systems; (i) irrigated rice, (ii) semi-intensive rain-fed rice, and (iii) low land rain-fed rice and upland rice.

The Government of Ghana then determined to implement Rain-Fed Rice Promotion Program due to the fact that 80% of domestic rice is produced semi-intensively in lowland in this country and to the expectation that big impact will be created for poverty reduction by supporting the rice farmers relying on unstable farming system. Consequently, the Government of Ghana requested the Japanese Government to implement "The Project for Sustainable Development of Rain-Fed Lowland Rice Production in The Republic of Ghana" (hereafter the Project).

The Project has been implemented in order to contribute to increase of rice production and promotion of rice industry in model sites in Ashanti and Northern regions by 3 components; (i) development of technical package of improved rain-fed lowland rice production practices, (ii) Verification of methodology to improve farming support system for sustainable rain-fed lowland rice production, and (iii) development of extension procedure for sustainable rain-fed lowland rice development. Ground level counterpart organization is Regional Agricultural Development Unit (RADU) and District Agricultural Development Unit (DADU).

The period of the Project is from 21th July 2009 to 21th July 2014. Since the Project has reached the mid-term of implementation, a joint Review was conducted in order to verify the expected achievement of project purpose and outputs. The objectives of the Review are summarized as below:

(1) To review the inputs, activities and achievements of project purpose and outputs and evaluate according to the five (5) evaluation criteria; namely *relevance, effectiveness, efficiency, impact, and sustainability*;

(2) To discuss the activities in the remaining project period based on the results of the Review; and

(3) To agree with stated objectives in (1) and (2) by both Japanese and Ghanaian sides and sign the Minutes of the Meetings (M/M).

1.2 Members of the Joint Team

(1) Japanese Side

	Assignment	Name	Present Occupation/ Position
1	Leader	Mr. Koichi KITO	Senior Representative of JICA Ghana office
2	Farming Support and Dissemination	Mr. Hideo MATSUHASHI	Director of Akita Agriculture Training Center
3	Rice Crop	Mr. Takashi SHIRAKI	Agrox Ltd.
4	Evaluation & Analysis	Mr. Akira MATSUMOTO	President, A&M Consultant Co., Ltd.
5	Evaluation & Analysis (2)	Mr. Kosuke NAGINO	Monitoring & Evaluation Officer, JICA Ghana Office
6	Planning & Management	Mr. Nobuhide HAYASHI	Project Formulation Adviser, JICA Ghana Office

(2) Ghanaian Side

1	Team Leader (Agronomy)	Mr. A. R. Z. Salifu	Deputy Director Directorate of Crops Services Ministry of Food and Agriculture
2	Member (Soil Fertility Agronomist)	Mr. A. Manu Addae	Deputy Director Directorate of Crops Services Ministry of Food and Agriculture
3	Member (Agric. Economics)	Mr. Richard Twumasi -Ankrah	Deputy Director Directorate of Crops Services Ministry of Food and Agriculture
4	Member (Agric. Extension)	Mr. Gabriel Owusu	Assistant Director Directorate of Crops Services Ministry of Food and Agriculture
5	Member/Secretary (Monitoring and Evaluation)	Ms. Theresa Owusu-Ansah	Assistant Agric Economist Policy Planning Monitoring and Evaluation Directorate Ministry of Food and Agriculture
6	Member (Economic Planning)	Mr. Francis Mensah	Assistant Economics Planning Officer External Resource Mobilization Division (Bilateral) Ministry of Finance and Economic Planning

1.3 Schedule of the Review

The schedule of the Mid-term Review is from 24th January to 10th February as detailed in Annex 1.

1.4 Major Interviewees

During the Review, the Team conducted interviews and held discussions with various stakeholders and resource persons as listed in Annex 2.

2. Methodology of Evaluation

2.1 Evaluation Framework

The evaluation framework was prepared based on the Evaluation Grid as shown in Annex 3 and delivered to the Project team and Ghanaian side.

2.2 Data Collection Method and Analysis

The Team had interviews with the persons concerned including project counterpart personnel (hereinafter referred to as the "C/Ps") and the Japanese experts dispatched for the Project. The Team also collected information through questionnaires from the concerned personnel. Then, the Team conducted field survey in the Project area in Ashanti and Northern regions.

2.2.1 Evaluation analysis

(1) Accomplishment of the Project

Accomplishment of the Project was measured in terms of Inputs, Outputs and Project Purpose in comparison with the objectively verifiable indicators of the Project Design Matrix (PDM; Ver. 3.0) as shown in Annex 4 as well as the Plan of Operation (PO).

(2) Implementation process

Implementation process of the Project was reviewed to see if activities had been implemented according to the schedule described in the PO, to see if the Project had been managed properly, and to identify obstacles and/or facilitating factors that had affected the implementation process.

(3) Review based on five (5) review criteria

1) Relevance

Relevance of the Project was reviewed to see the validity of Project Purpose and Overall Goal in connection with the needs of the beneficiaries, and the policies of the Government of Ghana (GoG) and Japan.

2) Effectiveness

Effectiveness was analysed by evaluating the extent to which the Project had achieved and contributed to the beneficiaries.

3) Efficiency

Efficiency of the Project implementation was analysed focusing on the relationship between Outputs and Inputs in terms of timing, quality, and quantity.

4) Impact

Impact of the Project was forecasted by referring to positive and negative impacts (to be) caused by the Project.

5) Sustainability

Sustainability of the Project was forecasted in technical, institutional, and financial aspects by examining the extent to which the achievement of the Project would be sustained and/or expanded after the completion of the Project.

3. Project Framework and Concept

3.1 Revision of PDM

The Team reviewed the Project PDM Version 2.0. As a result, it becomes necessary to modify the description of the indicators of Overall Goal, Project purpose and Outputs and also additional Important Assumptions for more appropriate ones in the course of the Project implementation.

Therefore, the Team proposes a revision of PDM Version 2.0 as described in the following table. The revised PDM (Version 3.0) is attached as ANNEX 4.

Proposed Revision of PDM (Ver. 3.0)

Item	Ver. 2.0	Proposed revision	Reason of Change
Indicator of Overall Goal a/Project purpose a	apply the model for sustainable development of rain-fed lowland rice production	applying the recommended techniques of the "Model"	It is necessary to clarify the specific techniques which can be applied by farmers.
Important Assumptions Overall Goal	Nil	a. The current policy for rice promotion is maintained. b. The agricultural input price which farmers usually purchase such as fertilizer, and also situation of rice marketing is not seriously deteriorating against for farmers.	According to the current situation, the left two (2) description of "Important Assumption" shall be made.
Indicator of Project purpose b	Nil	Based on the rice extension plan in target districts, the rice extension plan of Northern and Ashanti region is produced and submitted to MOFA.	Based on the Activity 2, the expected indicator shall be added.
Indicator of Output 1	1.Average unit yield is increased to more than 3.5 t/ha in model sites	1a.The average unit yield of trial plots in model sites is increased to more than 4.0 ton/ha in Ashanti and 3.0 ton/ha in Northern region. Also, the average unit yield of demo plots in priority areas is increased to more than the average yields of each district.	Specify the indicative target for "trial plots" only in model sites, and also modify the figure according to the different condition of each region. In addition, add the indicator for the demo plots in priority areas which will start activities during the remaining period of the Project. The above indicators should only apply to farmers adopting the recommended techniques of the Project taking into consideration the climate (flood, drought etc).
	1b.Qualified manuals for	1c.The manuals of technical package are compiled, and	Final attainment shall be not only the manual preparation

	technical package are prepared	made available to stakeholders.	but also disseminate the manuals to the related stakeholders.
	2a. Quality of rice in the model sites is improved	1b. The quality of rice produced by farmers who utilize the recommended techniques is improved in the model sites. (seed quality and seed production, etc)	Specify the Activity1 & also Activity 2 regarding to the improvement of rice quality
Indicator of Output 2	2b.Sale of processed rice in the model sites is increased	Delete	This current Ver 2.0 indicator was not directly related to the results of Activity 2, and also difficult to measure the sales and income of rice, so delete this indicator.
	2c.Income of famers from rice is increased in the model sites.	Delete	The same reason on the above, delete this indicator.
	Nil	2a. Formation of Rice Quality Improvement Forum and its results. (Based on 2012 Annual Plan, the Project team will confirm and determine this indicator by April 2012, and will finally approved by the SC meeting in 2013)	In spite of the above current indicator, add the indicator on the results on Activity 2-1 on how to strengthen rice stakeholders such as rice producers, processors and marketing groups, and also linkage of the indicator 1b "Quality of rice".
	Nil	2b. Based on farming condition in each plots, the rice cultivation calendar is prepared, and utilizing the calendar, the action plan is prepared and agreed by each community.	In order to fully recognize the timing and turning point of rice cultivation according to the natural environment, it is necessary to prepare annual calendar on rice cultivation as the indicator on the results on Activity 2-2 how to improve farming management capacities of farmers and farmers' groups.
	Nil	2c.XX number & good example of farmers and farmer's groups' activities on value-added related to rice farming support system (Based on 2012 Annual Plan, the Project team will confirm and determine this indicator by April 2012, and will finally approved by the SC meeting in 2013)	In spite of the above current indicator: 2b, add the indicator on the results on Activity 2-3 on how to improve post-harvest management/marketing capacities of farmers and farmer's groups.
	2d. Manuals for farming support system improvement are prepared	2d.The manual for improving the farming support system is produced and made available to stakeholders.	Final attainment shall be not only the manual preparation, but also disseminate the manuals to the related stakeholders.

Indicator of Output 3	3a.Effective Extension approach and methodology are identified	3a.The trainings for farmers and relevant agricultural stakeholders and district/AEA officials of the rice extension are conducted in XX types/ XX times/XX persons (Based on 2012 Annual Plan, the Project team will confirm and determine this indicator by April 2012, and will finally approved by the SC meeting in 2013)	The benchmark of Output 3 is not identifying the effective approach and methodology itself, but through the effective/ efficient trainings, C/Ps on region/districts including AEAs, they can produce rice extension plan and do execute their duties for assisting rice farmers.
		3b.In line with the district rice extension plan, extension activities, monitoring and evaluation are carried out at the target seven (7) districts.	
	3b.Manuals of extension are prepared	3c.The guideline and manual of rice extension are produced, and then made available to stakeholders.	Final attainment shall be not only the manual preparation but also disseminate the manuals to the related stakeholders.
Activity 2-2	2-4 Improve credit management capacities of farmers and farmers' groups	2-2 Improve farming management capacities of farmers and farmers' groups (including "access to credit in-kind capacities")	At the SC meeting, "credit in-kind" activity within the Project shall be focus only the technical advice and first-hand access such as rice package inputs.
Activity 2-3	2-3 Improve post-harvest management capacities of farmers and farmers' groups	2-3 Improve post-harvest management / marketing capacities of farmers and farmers' groups	According to the linkage and connection between Activity on "post-harvest management" and "marketing", compile these two activities as just one Activity 2-3.
	2-5 Improve marketing capacities of farmers and farmers' groups		

3.2 Project Concept

The Project is implemented based on the following concepts. Overall framework of the Project is indicated in ANNEX 12.

3.2.1 Identifying the Practical Technologies for the "Model" through the Participatory Exercise

The Project is based on the experiences of Japanese rice cultivation and its technologies. However, the project does not intend to transfer the technologies holistically to the Model Farmers but modified the practices to suit site specific conditions in the project areas. Towards sustainable rice development in Ghana, the Project conducted trials and finally selected the farmer friendly and adoptable technologies in the "Model". Thus the technologies in the model have been selected using farmer participatory practical lessons and the project will maintain this concept in the second phase of

the Project.

3.2.2 Identification of Quality Rice

After a series of studies by the Japanese experts and Ghanaian counterparts, the Project has identified that the quality of rice should mean less broken rice, no stones and more aromatic character. On the basis of this, the Project tried to increase unit yields of quality rice. The approaches required to improve rice quality are emphasized in the application of both Improved Technical Package and Farming System Management.

3.2.3 Adequate Input on Appropriate Timing for Rice Development

The Team found out that timely delivery of adequate inputs for rice cultivation is essential to increase the unit yields of rice. As part of the lessons learnt, the project recognizes the significance of Block Farming system as one of the approaches which can substantially contribute to rice production. Although the Block Farming system faces some challenges especially with respect to delivery and recovery of required inputs, the Project also tested a "Credit in Kind" system and supplied the inputs to the Group Farmers. Having experienced increased in yields, the Project expects the Farmers Groups should be able overcome any difficulties in repaying.

Also the project concentrated on technologies based on manual of operations. Because the project concept to use locally accessible equipment and to encourage self-help efforts of farmers, the Project does not supply the machineries such as tractors, power tillers and milling machines to the Group Farmers and Groups.

3.2.4 Harmonization with Ghanaian Development Policy

The Project duly recognizes the Government's Policies in documents such as FASDEP II, METASIP and NRDS, all of which aims at ensuring self-sufficiency in rice production. Thus the Project activities are designed to complement Government programs for ensuring increased domestic rice production.

4. Project Performances and Implementation Process

4.1 Achievement of Input (as of January, 2012)

4.1.1 Japanese Side

(1) Dispatch of Japanese Experts (long-term and short-term):

Long-term and also short-term Japanese experts have been dispatched in various fields, such as Team Leader/Rice Production, Rice Cultivation Technology, Extension/Project Management, Land Development and Administrative Coordinator. In addition, the following short-term Japanese experts have been dispatched, Farming System Management, Participatory Rural Appraisal, Post-harvest Processing, Marketing, Farming Support, Farming Analysis i.e. etc. (Annex 5-1-1). The total experts' assignment was 109.55 M/M (As of 31st of January, 2012).

(2) Training in Japan for the Project C/Ps:

Sixteen (16) C/Ps of the Project have participated in the training in Japan and Burkina Faso as of 31st January 2012. (Annex 5-1-2)

(3) Provision and Procurement of Machinery and Equipment:

Vehicle, Motorbike, Equipment for post-harvest, Survey Set, Miller, Destoner, Stone Picker, Huller, Rice Cleaning Machine, Air Conditioner, Copier, Projector, Desktop/Laptop PC, GPS, Digital Camera, Printer and others have been provided. The total cost for the equipment provision was 242,867.25 GHC as of 31st January 2012. (Annex 5-1-3 and the detailed equipment list is attached to Annex 6)

(4) Local Operation Cost:

Local operational cost allocated by JICA for the implementation of the Project activities was 616,768.65 GHC from the year 2009 until the third quarter of 2011. (Annex 5-1-4)

4.1.2 Ghanaian Side

(1) Assignment of the Project C/Ps

Currently, fourteen (14) persons are assigned as C/Ps and administrative personnel. (Annex 5-2-1 and 5-2-2)

(2) Project Operation Costs

Presently, the followings are provided; project office for Japanese experts and the C/Ps in Kumasi and Tamale, utilization of facilities, conference room for meeting and one small storage for equipment (Annex 5-2-3). For project operation cost, 434,497 GHC of local expenses has been allocated by the Ghanaian side (as expenses on the Year 2011 only). In addition, common service expenses for electricity, water, etc. are disbursed by the MOFA. (Annex 5-2-4)

4.2 Items of Analysis

4.2.1 Project Performance

Progress of each project activity was confirmed through the Review. Based on the results, achievement of Output and Project Purpose was measured in terms of the objectively verifiable indicators of the PDM.

4.2.2 Implementation Process of the Project

The list of major project products such as publication and documents are attached in ANNEX 7. Accomplishment of the Project was measured in terms of Inputs, Activities, Outputs and Project Purpose, all of which are based on the R/D, PDM and PO. As the progress and results of implementation of the Project, the summary of project activities which were conducted by the Project are attached in ANNEX 8. Furthermore, the attainment of objectively verifiable indicators described in the Project's PDM is indicated in ANNEX 9.

The Team confirmed the implementing structure of the Project. The present steering committee members which were assigned by the 2nd Steering Committee on the 25th June, 2010 are attached in Annex 10.

5. Evaluation of Project Results

5.1 Evaluation by Five Criteria

The Review Team assessed the Project's performances with respect to its relevance, effectiveness, efficiency, impact and sustainability.

5.1.1 Relevance

This refers to an assessment of the validity of project purpose, overall goal in relation to the needs of beneficiaries and policies of the Governments of Ghana and Japan.
By these criteria, the Project is evaluated as high for the following reasons:

(1) Policy of the Government of Ghana (GoG)

Rice is one of the five selected food security crops (rice, maize, yam, cassava and cowpea), identified in the FASDEP II. For this reason, FASDEP II Programmes have been developed in the METASIP to promote rice production in the country. The Project is therefore consistent with national policies priorities and programmes (FASDEP II: 2007 -2012 & NRDS).

Over the years, Ghana has been experiencing deficits with regards to increasing demand for rice due to insufficient production and growing population. As a result, rice imports have consistently been increasing since 2001. To reverse this trend, Ghana has developed the NRDS that is geared towards expansion of local rice production by the year 2018 in order to contribute to food security, foreign exchange savings and increasing income for small-scale farmers. This is in line with the Project Purpose and Overall Goal.

(2) ODA Policies of Japan

Rice promotion is one of the priority areas of the Japan's ODA policy to Ghana. Similarly the Project fits into JICA's Country Program for Ghana, namely "Program of Ghana Domestic Rice Promotion". Ghana is also one of the first priority countries for the Coalition for African Rice Development (CARD) of which Japan is a partner.

(3) Needs of the Target Groups/Beneficiaries

In order to make up for some of the shortfalls in rice production, this Project Purpose is aimed at increasing productivity, production and promotion of locally produced rice. This makes the Project quite relevant to the country needs, as well as rice producers, distributors and consumers in Ghana.

Rice farmers in the Project areas are very keen to learn rice cultivation techniques in order to cope with the challenges of rain-fed agriculture and un-favorable land conditions, so as to obtain optimum

higher yields to improve their incomes and to satisfy their rice consumption needs.

Thus, the Project is evaluated as a very appropriate response to the technical, economic and social needs of the beneficiaries.

(4) Relevance of Project Approach and Design

In Ghana, about 80% of domestic rice is produced semi-intensively under rain-fed low land, in-land valley and upland conditions. Most farmers use only traditional and non-intensive methods, so the productivity is still very low and unstable at the small-scale farm level. Therefore, it is relevant that the Project focuses on rain-fed lowlands. In addition, the approach and design of the Project is considered to be appropriate and, because of the minimal input levels required, the introduced techniques are applicable and suitable for farmers' situation.

(5) Comparative Advantage of Japanese Cooperation

Rice is a Japanese staple food. Japan has a long history and high experience in rice development techniques and cultivation.

JICA has a lot of experiences in providing technical assistance on rice cultivation techniques to many countries including Ghana. Therefore, it is of comparative advantage to utilize the experience and knowhow of Japan to fully disseminate and utilize the technologies in Ghana. The technical cooperation with rain-fed rice cultivation is the first of this kind by Japan.

5.1.2 Effectiveness

The Project Purpose is stated as "Dissemination of the model for sustainable development of rain-fed lowland rice production is accelerated within the Project areas."

The Team observed that the technical package of improved rain-fed lowland rice production practices has been developed which has resulted in higher yields on both trial plots and individual plots since the Project started. It is therefore certain that the "model for sustainable development of rain-fed lowland rice production" can be disseminated to rice farmers who are willing to acquire the technical skills and adopt into their farmland.

At midterm stage, achieving the Project purpose could not be evaluated in detail. However, the extent of the effectiveness of the Project is assessed as satisfactory by the Team for the following reasons:

(1) Prospect of Achieving Project Purpose

The Project duration is five (5) years. The first two and half years focused on "Introduction and Process of Models". The second phase will emphasize on "Development of the Model". The Team observed that the Project is on the right track to achieve the Project Purpose and therefore proposes that planned project activities should be continued and successfully carried out within the remaining period of the Project.

(2) Contribution of Outputs to the Achievement of Project Purpose

All the Project activities have been carried out even though few activities are behind schedule due to the delays in the dispatching JICA expert to the Project. So far, planned and implemented activities have produced the Outputs that are contributing to attaining the Project purpose.

In the first place, technical package of rice production practices has been developed (as Output 1), which has resulted in better yields.

Secondly, the Project has examined various methodologies to improve farming support system (as Output 2). In addition, the dissemination of technical package through effective and efficient extension procedures for sustainable rain-fed lowland rice development (Output 3), is necessary for rice farmers' and other stakeholders' adoption. It is apparent from field visits and discussions with stakeholders to state that further capacity enhancement of Ghanaian C/Ps as well as the beneficiaries under the Project is expected to contribute to achieving Project Purpose to a large extent by the end of the cooperation period.

The logical sequence between Outputs and Project Purpose is appropriate, and all the three (3) Outputs will significantly contribute to the achievement of Project Purpose.

(3) Causal Relation

The following are identified as promoting and hampering factors.

1) Factors that promoted realization of effects

a) Verification of technical package as "Applicable" and also "Profitable" to small- scale rice farmers

The basic techniques for rice cultivation introduced by the Project are proven as user friendly, adoptable and affordable. For instance, basic knowledge of land/bond development, such as use of interlocking bunds can help reducing the height margins and ensure water distribution. At the same time, basic techniques for rice cultivation, such as good seed selection, leveling, transplanting and timely split fertilizer application are quite useful for farmers who did not have knowledge previously to apply such techniques. These techniques led to better crop performances and better yields as a result of application of improved farming practices.

The contact farmers during the inception of the Project were challenged with group cohesiveness and poor participation. However, during the course of time, the good results being achieved in better field management and yields improved cooperation among the farmers' groups. It is worth mentioning that the technical package are easily applicable and has contributed to the change in attitudes of rice farmers, and served motivational factor.

b) Sensitization of farmers through various interactive extension methods

Through the Project, various extension methodologies have been conducted. One of the effective methodologies is "Trial Plot". This is the method where contact farmers show on-farm good demonstration of rice production for other farmers to learn. The second method which is "Field Trip" gives real opportunity to farmers to exchange techniques and experiences on other farmers' fields.

The next areas "Field day" & "Contest of Best Farmers"; these are the good approaches of dissemination of the Project technical packages and also provides the opportunity of promoting the Project. These methodologies are promoting factors to enhance adoption of technologies by rice farmers.

c) Advice and facilitation by local authority (DADU and AEA)

In order to disseminate the techniques and information on rice cultivation and also facilitate access to timely tractor services and agricultural inputs etc, the DADUs and AEAs, played important roles which influenced the attitude of beneficiary rice farmers as well as other farmers in the community. In addition to the provision of technical backstopping, they also facilitated networking among actors along the rice value chain. The Team observed that they contributed to promoting smooth implementation of the Project activities, efficiently transferred technologies as well as established good relationship with the Project stakeholders.

2) Factors that impeded the realization of effect (hampering factors)

a) Difficulty of on-time rice cultivation

The major challenge of the Project is that rice cultivation depends on water availability. Rainfall is out of control, but once water becomes available, farmers can prepare their lands for rice cultivation according to the natural condition. In addition, land development which requires tractor services due to their land sizes, especially in the Northern region and the timely application of input influences yield levels.

Delays in tractor services, unavailability of certified seed and untimely application of fertilizer caused to poor application of recommended practices resulting in lower yields.

b) Unfavourable natural condition and farmer group cohesion

Within the Project areas, several challenges were encountered which was beyond the Project control. For instance, flooding in some parts of the Project districts in Ashanti region resulted in destruction of some fields with no harvest whilst some parts of Northern region experienced drought which resulted in poor ripening and yields. To cope with such problems, the Project has taken measures or consideration, such as early cultivation, timely establishment of fields and avoidance of flood prone areas.

Land tenure issues was a challenge to land arrangements for expansion especially in Ashanti region where farmers were restricted to small plots which was a discouraging factor to group cohesion and farmer participation. The AEAs are facilitating and negotiating access to the land through MOU, signing of agreement with land owners, community chiefs and group cohesion sensitization.

5.1.3 Efficiency

Project implementation efficiency has been accessed as moderate for the following reasons.

(1) Efficiency of Project Inputs and its Utilization

In general, inputs from the Japanese and Ghanaian sides have been appropriate in terms of quantity, quality and timing at most levels. (See ANNEX 5 and 6)