

FARMING SITUATION SPECIFIC PRODUCTION RECOMMENDATION - A STUDY IN JORHAT DISTRICT OF ASSAM

R. C. Sarmah¹ and G. Goswami²

Grass root approach has been the key principle of extension education since its inception. Research and extension workers conduct survey on farming conditions and needs and problems of the farmers for formulating agricultural development plans. To this extent the principle of the grass-root approach is well honored. The workers then analyse the needs and problems of the farmers according to their knowledge on the concerned farming condition, work out solutions on the problems, prioritize activities needing improvement, decide on resource requirement and allocation, prepare plan and implement accordingly. When crucial decisions on improvement of a farming condition are taken by the workers solely, the principle of grass-root approach takes a back seat and the approach becomes top-down. No doubt, this approach has considerable success in well-endowed areas where demand for new technology is high. In rainfed areas where heterogeneity is too large, the top down approach, however, is a wastage.

The fact remains that in the green revolution area in India where cent percent irrigation is ensured, productivity of land is rapidly reaching the saturation point. Hence the focus is on raising productivity in the rainfed areas where top-down approach has to be dispensed with. Experience also tells that bottom-up approach is not an easy passage to development everywhere. Different situations need different techniques for involving people in their development process. Although a good menu of such participatory techniques are available at present, one has to have skills in

1. *Professor, Department of Extension Education, Faculty of Agriculture, Assam Agricultural University, Jorhat- 785 013.*

2. *Asstt. Professor, Department of Agricultural Extension, SASRD, Nagaland University, Medziphema, Nagaland-797 106.*

selecting the techniques to get the desired effect. Not many research and extension personals are convergent in these techniques. Moreover, these techniques are not adequately standardized for use in research. Therefore, any publication delving on the effect of these techniques becomes useful document to understand their implication on a particular development aspect. This study was also done using a bottom up approach where a few participatory techniques were incorporated. It is hoped that the learned readers will further develop the methodology keeping in view the quality of the findings of this study and follow-up action taken.

The purpose of this study was to identify production practices which could be integrated in a specific farming situation by the farmers. The integration of practices had two planks - ecological feasibility and economic compatibility. In order to do so, much care had been taken in the identification of farming situation. It also becomes an essential prerequisite for determining the specific objectives of the study. Following steps were followed for identifying the farming situation.

1. **Selection of physiographic zones** - Assam has six agro-climatic zones. Every zone is further divided into physiographic zones according to land topography, soil characteristics and cropping systems. Keeping in view of the quantum of work to be performed to complete the study, one zone, i.e. Upper Brahmaputra Valley Zone (UBVZ) which embraces Jorhat district where Assam Agricultural University headquarter is situated, was selected for the study. UBVZ has three distinct physiographic zones. These are flood plains, gently sloping plains and pidmont plains. The flood plains are the largest physiographic zone, hence selected for the study.
2. **Identification of farming situation** - The study was conducted in Jorhat district for administrative convenience. Besides, Regional Agricultural Research Station (Zonal Research Station) is also situated in this district. The district has two agricultural subdivisions - Jorhat & Titabar. Extensive discussions were done with the scientists of RARS and the sub-divisional officers of the Department of

Agriculture of the aforesaid subdivisions for the purpose of identifying widely prevailed but broad farming situation. The land classification map of the district served as an important tool at this stage. The parameters of the identified farming situation were mild low land - kharif - rainfed of the main crop, *sali* rice³.

In order to identify the major farming situation of *sali* rice, extensive discussions were again made with the Agricultural Extension Officers (AEO) and the VLEWs of the two sub-divisions when they assembled for cluster trainings. The views of the scientists of RARS and the Directorate of Extension, AAU were also taken. The major farming situation thus identified was *ahu* rice as preceding crop - *sali* rice as main crop - rabi vegetables (cabbage, cauliflower, knol khol & brinjal) as succeeding crop in the mild low land - kharif - rainfed condition. Another parameter was added at this stage was small size land holdings. Because it was learned from the discussion with the AEOs and VLEWs that big farmers usually leased out their land to small and marginal farmers in this situation.

3. **Objectives of the study** - Taking help of the guidelines given by MANAGE, 1992 the objectives of the study were determined as given below:

- i) To study the extent of adoption of production recommendations of *sali* rice in the given farming situation.
- ii) To identify the critical factor for adoption gap in *sali* rice production in the situation vis-a-vis *ahu* rice and rabi vegetables.
- iii) To suggest strategy for increasing *sali* rice production in relation to *ahu* rice and rabi vegetables in the given farming situation.

3. *Rice is the principal crop in Assam Cultivated in three season, Ahu or Summer rice is normally sown in March - April and harvested in June - July. Sali or winter rice transplanted from July to August and harvested in late November and December. Boro or spring rice is transplanted in December - January and the crop is ready for harvest in April - May. Another rice called Bao or deep water rice is cultivated in areas inundated by flood waters, it is direct seeded along with ahu rice and harvesting time coincided with the harvest of sali rice. The main rice is however sali rice covering upto 70% of the total cropped area of the state.*

Methodology

The nature of the study was such that at every stage collection as well as verification of information was required. Therefore, the study area was narrowed down to one VLEW circle in each sub-division.

- i) **Selection of VLEW circles** - The VLEW circles where the given farming situation was present, were first identified. The VLEWs and concerned AEOs were consulted at Cluster Trainings for selection of a typical VLEW circle in one sub-division. Finally, Sonari VLEW circle from Jorhat sub-division and Raidungiuri VLEW circle from Titabor sub-division were selected for the study.
- ii) **Selection of villages and sample farmers** - The investigators visited the VLEW circles one at a time and had dialogue with the VLEW and the executive members of *Pat har Parichalana Sam ity* (field management cominittee constituted by fanners themselves) for locating the villages where selected farming situation was commonly found. Names of 5 villages of Sonari VLEW circle and 4 villages of Raidungiuri VLEW circle were obtained in this way. The investigator then visited these villages to ascertain the validity of the information and was found correct. From these villages, two villages from each VLEW circle were then selected randomly for the study.

As stated earlier, the respondents of this study would be those small farmers who had *ahu-sali-rabi* vegetables cropping pattern in rainfed mild low land condition. For this purpose, the PPS members were requested to prepare a list of such small farmers of each of the villages. From the list of every village 50% small farmers were selected randomly. Care was taken to include in the sample proportionate number of small farmers from each of the contiguous crop fields of a village. The sample small farmers of a village were then invited for a dialogue through the good office of the PPS. The investigators introduced themselves to the assembled sample farmers, told the purpose of the visit, and had informal talk about the village and prevailing farming situations, appreciated them for the number of crops cultivated by them and requested them to cooperate in conducting the study. They were

then requested to draw a village map showing settlement pattern, crop fields and water flows, specifically indicating their individual houses and crop lands. The map became useful tool for contacting a sample farmer either in his house or field besides other uses.

It should be mentioned here that the total number of farmers in the sample was 126 i.e. 63 from each sub-division. The numbers were however, matched for the two subdivisions at the time of selection.

- iii) **Selection of practices of *sail* rice** - The package of practices of *sah* rice recommended for upper Brahmaputra Valley Zone were taken into account for the study. There were 16 such recommended practices. It was felt that thorough understanding of the extent of adoption *sail* rice production practices, required the data on extent of adoption of *ahit* rice and of rabi vegetables. Hence extent of adoption and adoption gap of these crops were also studied.
- iv) **Measurement of adoption gap and critical factor for adoption gap** - Extent of adoption of each of the practices of *sail* rice production was collected from sample farmers individually. Based on this response, the sample farmers were classified into full adopters, partial adopters and non-adopters.

Adoption gap of every practice of *sail* rice was calculated using Technological Gap Index (IARI, 1979). The gap was expressed in percentage.

Critical factor for adoption gap is conceptualized as the highest inhibiting factor determining the full adoption of recommended practices of *sail* rice. Every respondent was asked to name the factor he deemed to be the main cause preventing full adoption of the practices. The factor cited by majority sample farmers was initially taken as the critical factor for adoption gap in *sali* rice. The same procedure was followed for identification of critical adoption gap for *ahu* rice and rabi vegetables.

Two months after the completion of data collection from individual sample farmers triangulation was done in each village. The data on extent of adoption of recommended practices of the crops and adoption gap were presented to

them. They were then requested to give their views on the correctness of the data. Probing was done on their views. Finally they were asked about the main factor for adoption gap of individual crops. Interestingly the assembled sample farmers approved the information given by them earlier individually.

- v) **Strategy for minimizing adoption gap** - In the meeting with farmers for identification of critical adoption gap, participatory discussion was held to find out ways and means in order to address the critical adoption gap and thereby minimize overall adoption gap. The possibility of introducing alternative practices was also discussed and views were taken. Final strategy was drawn from interface between farmers and subject matter specialists.

Findings and Discussion

I. Adoption gap in *sali* rice :

Table - 1 shows the extent of adoption and adoption gap in recommended practices of *sali* rice. Of the 16 practices, full adoption was found in 5 practices although by varying number of farmers. Tillage operations and age of transplanted seedlings were fully maintained by cent percent farmers. Full adoption of fertilizer application method was found among 65.87 per cent farmers while control of insects pests by using recommended doses of pesticides was fully adopted by 46.03 per cent and that of disease by 15.08 per cent farmers.

Table 1: Extent of adoption and adoption gap in cultivation practices of *Sali* rice

n=126

Practice	Full adopters	Partial adopters	Non adopters	Adoption gap of partial adopters (%)	Overall adoption gap (%)
1. Seed treatment	0	0	126 (100.00)	0.00	100.00
2. Tillage	126 (100.00)	0	0	0.00	0.00

Practice	Full adopters	Partial adopters	Non adopters	Adoption gap of partial adopters (%)	Overall adoption gap (%)
3. Seed rate (kg/ha)	0	126 (100.00)	0	55.74 *	55.75 *
4. Transplanting					
i. Seedling age (DA)	126 (100.00)	0	0	0.00	0.00
ii. Spacing (sq.cm)	0	126 (100.00)	0	19.56	19.56
iii. No. of seedlings per hill	0	126 (100.00)	0	100.00 *	100.00 *
5. Gap filling (DA)	0	94 (74.60)	32 (25.40)	44.68	58.73
6. Weedling					
i. Chemical	0	0	126 (100.00)	0.00	100.00
ii. Mechanical	0	0	126 (100.00)	0.00	100.00
7. Nutrient use					
A. Dose					
i. FYM (t/ha)	0	126 (100.00)	0	81.25	81.25
ii. Urea (kg/ha)	0	126 (100.00)	0	62.24	62.64
iii. SSP (kg/ha)	0	97 (76.98)	29 (23.02)	84.65	88.18
iv. MOP (kg/ha)	0	101 (80.16)	25 (19.84)	44.32	55.37
B. Application Method	83 (65.87)	0	43 (34.13)	0.00	34.13
8. Chemical control of insects	58 (46.03)	0	68 (53.97)	0.00	53.97
9. Chemical control of diseases	19 (15.90)	15 (11.90)	92 (73.02)	100.00	84.92

Overall adoption gap of respondents in *Sali* rice cultivation = 61.38%

* Indicates over adoption

N.B. Figures in the parentheses indicate percentage

The percentage of partial adopters were much higher in five practices viz, seed rate, spacing in transplanted seedlings, number of seedlings per hill, use of recommended quantity of FYM and urea, where cent percent partial adoption was evident. Gap filling was partially adopted by 74.64 percent farmers, use of recommended quantity of SSP and MOP by 76.98 per cent and 80.16 percent farmers respectively and control of diseases by using recommended doses of fungicides by 11.90 percent farmers.

Practices not adopted at all were seed treatment and weeding. Control of insect pests and diseases by recommended chemicals were not practiced by 53.97 percent and 73.02 percent farmers respectively. Gap filling was not done by 25.40 percent farmers, SSP and MOP were not used by 23.02 percent and 19.84 percent respectively and 34.13 percent farmers did not follow the recommended application method of NPK.

As regards adoption gap among partial adopters, the gaps against the practices were quite high indicating the fact that the adopters were far away from the recommendations. The reason for adoption gap in seed rate was due to use of excess quantity of seeds from their own stock. Excess seeds produced excess seedlings and hence spacing was reduced from recommendations as well as more seedlings were put per hill to invest the seedlings produced. This is why adoption gap in spacing and seedlings per hill appeared. Reason for higher adoption gap in nutrient use was mainly unwillingness to invest optimally on fertilizers and for control of diseases by chemicals was lack of adequate knowledge.

Overall adoption gap shown in the last column of the table was on higher side for almost all the 16 practices. This was due to much deviation from recommendations while adopting a practice rather than totally non-adopting the practice. Practices viz, seed treatment and weeding either by chemical or by mechanical methods were not practiced by rainfed rice farmers. Farmers had indigenous methods for preserving seeds, which the seeds free from seed borne diseases, and they considered their practices better than recommended practices. It was observed that weed infestation was very less in puddled method of cultivation. Since the sample farmers cultivated *sali* rice on puddled soil, they did not see the necessity of weeding.

Taking all the respondents together, total adoption gap for all the practices of *sail* rice was calculated at 61.38 per cent. Similarly, total adoption gap in *ahu* rice was 58.64 percent. In cabbage, cauliflower, knol khol and brinjal were 47.62 percent, 44.57 percent, 44.28 percent and 43.62 percent respectively. This shows that total adoption gap was highest in the major crop i.e. in *sail* rice.

II. Critical factors for adoption gap

A) *Sail* rice : The data on the aspect were collected by asking an open-ended question to individual sample farmers. The highest inhibiting factor identified by 53.97 percent farmers was "lack of adequate quantity of water at the critical stages of the crop". However, 26.98 percent farmers said that the main factor was "high insect pest infestation" and further 19.05 percent farmers gave "uncertainty in the availability of required fertilizers and pesticides" as the major cause of either partial or non-adoption of production practices.

In order to achieve general agreement on the critical factors and the reasons for indicating those, a discussion with the farmers per village was done in presence of crop specialists. The issues raised by the farmers were thoroughly deliberated and field visits were made to authenticate farmers' views. Seasonality diagramming was judiciously used at this stage.

This exercise led to the identification of actual critical factor common to both the agricultural sub-divisions. The factor was "lack of adequate quantity of water at critical stages of *sali* rice". The reasons for recognising this factor were as follows

- i) The normal rainfall distribution pattern of Jorhat and Titabor Agril. Subdivisions during the *sali* rice seasons (Fig. 1) reveals that there was sufficient rainfall during the vegetative phase of *sali* rice which then sharply declined towards the reproductive and ripening phase of the crop. The number of rainy days per month also sharply declined from the early vegetative phase towards the reproductive phase of the crop. Low rainfall combined with less number of rainy days during the

reproductive and ripening phase would certainly affect the crop productivity.

- ii) During the reproductive phase, the atmospheric evaporative demand is quite high as there is low RH and the sky above remains clear. Hence, low rainfall, coupled with less number of rainy days during this period in association with the atmospheric factors create a moisture stress condition during the most critical stages like panicle initiation and flowering, which directly hampers the yield potential.
- iii) During the month of October the rainfall received was 140mm in both the locations with only 10 rainy days (Fig. 1). This implies that if there is no rainfall continuously for the remaining 20 days, there is possibility of a dry spell during the reproductive stages of the crop, hampering the crop yield.
- iv) Frequent occurrence of monsoon aberrations including irregularities in monsoon onset and retreat disturbs the normal rainfall distribution pattern which affects the normal crop culture activities.
- v) During the high rainfall period (July - August) sometimes short spell of draught occurred due to irregularity in duration and intensity of rainfall which affected the cropping schedules, e.g., 201.6 mm rainfall was received in 29 spells in July 1989 as compared to 589.6 mm in 10 spells in July 1994 in Titabor Agril. Subdivision. It indicates a dry spell of 20 days in July 1994 in comparison to July 1989. This would delay land preparations, sowing and transplanting schedules and ultimately the whole cropping season would be delayed.
- vi) It was observed that there was no water storage structures in the field to collect excess rainwater during the high rainfall period and supply it to the crop during the moisture stress condition.
- vii) Again there was no mechanism for regulating inflow and outflow of water in the main field for which surface runoff, loss of top soil and nutrients had been a common phenomenon. The rainwater taking its own course flowed into surrounding depressions leading to siltation etc.

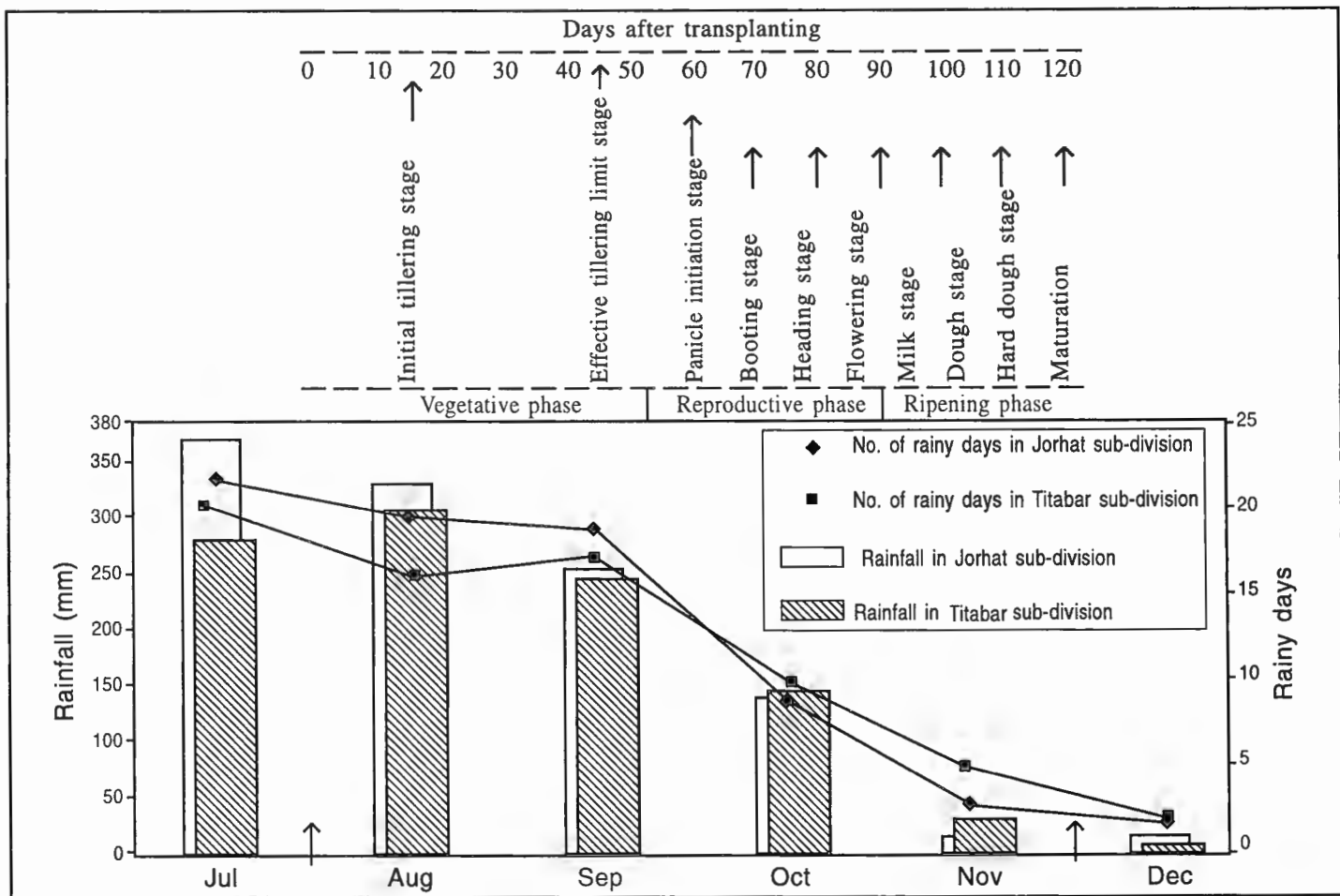


Fig.1 Relationship between *sali* crop growth stages and normal rainfall distribution pattern of Jorhat and Titabar Agril. sub-divisions of Jorhat district during 1988-1997

B) **Ahu rice** : When asked individually during survey, cent percent farmers indicated the critical factor as “lack of assured irrigation facility”. At the time of group discussion, the same factor was amplified by all farmers. The reasons were as follows -

- i) The average annual rainfall distribution pattern of Jorhat and Titabor Agril. Subdivisions (Fig. 2 & 3) reveals that during the early crop establishment and vegetative growth stage of *ahu* rice (February - March), the rainfall received and the number of rainy days was very less. This phenomenon created problems in land preparation and field puddling. Lack of proper puddling condition led to high weed infestation, creating stiff crop-weed competition.
- ii) The amount of rainfall and the number of rainy days gradually increased towards the crop maturity and harvesting period (June). Presence of excessive moisture during maturity led to high moisture content in grains for which harvesting had to be delayed. Moreover, there was every possibility of high insect pest attack on such grains during

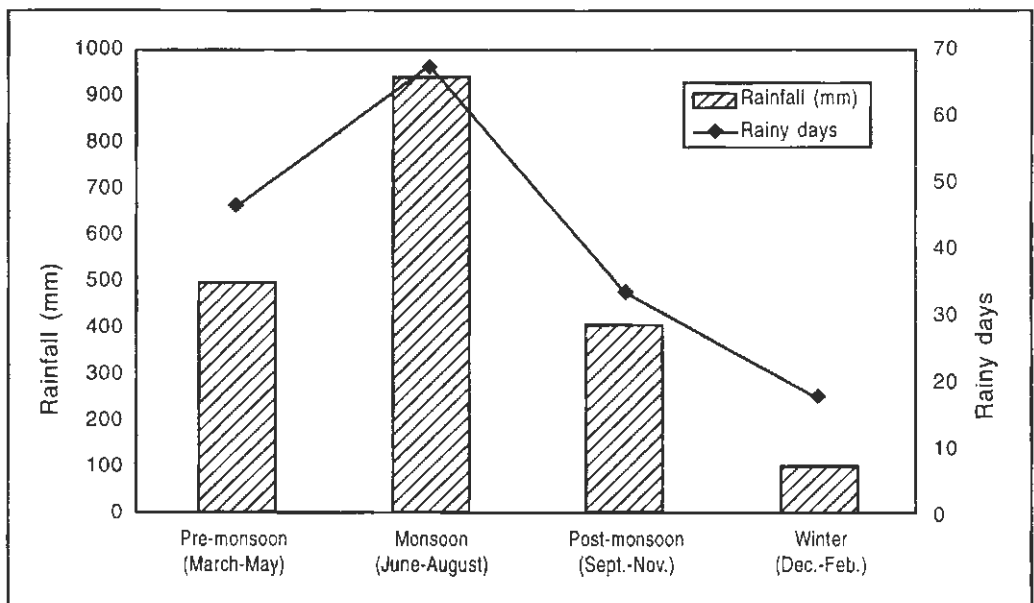


Fig.2 Seasonal rainfall distribution pattern of Jorhat Agril. Sub-division during 1988-1997 (Source : DAO, Jorhat)

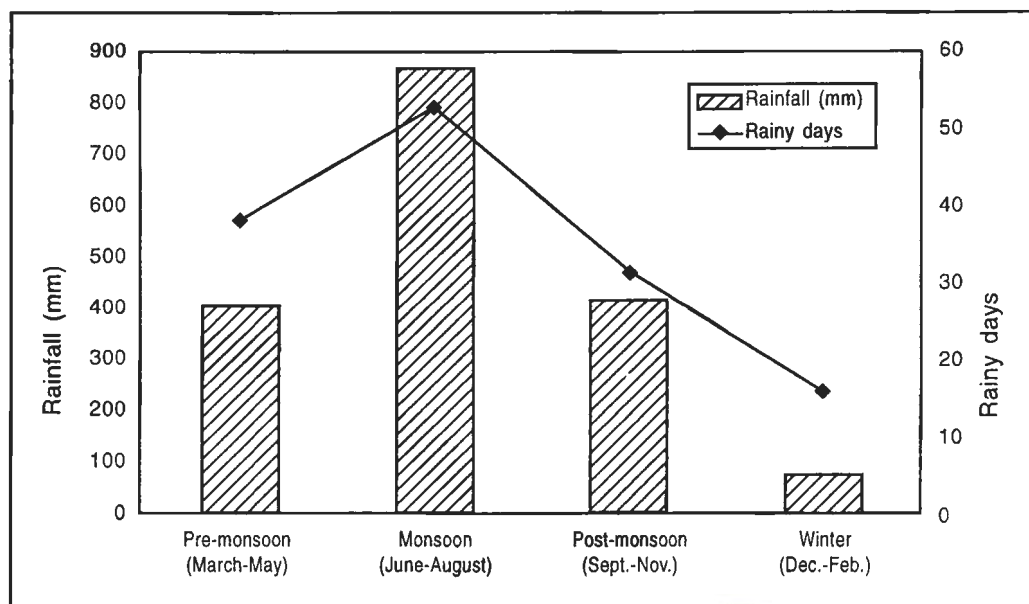


Fig.3 Seasonal rainfall distribution pattern of Titabar Agril. Sub-division during 1988-1997 (Source : DAO, Jorhat)

storage. Farmers could have advanced the crop season had there been assured irrigation facility.

- iii) From field observations it was noticed that also prevalent were problems like lack of water storage facilities, lack of scientific water control system and absence of any land grading and slope maintenance practices which directly hampered the crop growth and reproductive potential.
- iv) Frequent spells of draught might also be encountered during the early vegetative stage of the crop e.g. 127.8 mm rainfall was received in 23 spells in March '94 as compared to 12.5 mm rainfall in only 4 spells in March '95 in Jorhat Agril. Sub-division. It indicated a dry spell of 20 days in March '95 in comparison to March '94. This condition delayed transplanting schedule and created a moisture stress condition during critical crop stage, like tillering period.

These were the hindrances for drastically reducing the area under *ahu* rice by the farmers.

C) **Rabi vegetable** : 58.73 per cent farmers cited “low economic return” from vegetable cultivation as the critical factor for adoption gap because of absence of regulated markets. Critical factors cited by other farmers were not worth mentioning as very small percentage of farmers felt about those factors. However, during group discussion, farmers agreed that “lack of irrigation facility” was the major cause of “low economic return” from vegetables. The figures on rainfall convincingly prove this point.

III. Strategy for increasing *sali* rice production

The focal point of the suggested strategy was to reduce adoption gap as well as improving the resource base in a way that would be easier for the farmers to integrate the suggested measures in their farming situation. A contingency plan was hence formulated by considering the following findings:

- i) The farmers had been cultivating long duration varieties of the three crops in their cropping systems which resulted in overlapping of cultural practices.
- ii) This impeded large-scale cultivation of high value crops like rabi vegetables.
- iii) It also contributed to a low cropping intensity of 131.37 per cent on an average.

The contingency plan had two parts - production plan and extension education plan. The production plan was as follows :

March 1 st week	June 1 st week	June mid	October last	November mid	February mid
Ahu (Transplanted)		Sali (Transplanted)		Rabi vegetables	

The varieties suggested for this cropping plan were:

<i>Ahu</i>	Duration (day)	Sali	Duration (days)	Rabi vegetables	Duration (days)
i. Culture-I	100-105	i. IR-36	110-125	a. Cabbage i. Pride of India ii. Golden acre	80-90 80-90
ii. Luit	100-105	ii. Jaya	125-130	b. Cauliflower i. Snow Ball-16 ii. Pusa Snowball	90-95 90-95
iii. Kapilee	100-105	iii. Satya	130-135	c. Knolkhol i. White Vienna	60-70
iv. Rangadoria	115-120	iv. Basundhara	130-135	d. Binjal i. Borbengena ii. Pusa Purple Long	110-110 100-110

Seeds for the suggested rice varieties were available in RARS, Titabor which was centrally located and easily accessible from all parts of the district. Seeds for the recommended rabi vegetables could be procured from trading agencies of agricultural supplies and also from authorized dealers of certified seeds.

The plan also laid emphasis on the following areas for reducing the prevalent adoption gaps amongst the cultivators in various cultivation aspects.

- i) The concept and practices of 'Integrated Nutrient Management' should be introduced for removing the huge imbalance in plant nutrient use as recorded in the findings. This calls for balanced fertilization with both organic and inorganic nutrients at the recommended doses, in the recommended time by following recommended application methods.
- ii) Introduction of seed selection and seed treatment practice of rice seeds, which is an important prophylactic measure in the crop establishment stage.
- iii) Maintenance of optimum plant population by adopting recommended seed rate, spacing, number of seedlings per hill and time of gap filling.

This will promote judicious use of costly inputs like seeds and seedlings.

- iv) Introduction of 'Integrated Pest Management' especially for reducing unit cost of production.

The following practices were suggested in order to help farmers cope up with uneven rainfall distributions. This was based on inference from the analysis of the predominant annual rainfall distribution pattern in the study area:

- i) Moisture stress tolerant variety of *ahu* crop e.g. Rangadoria can be adopted in locations prone to moisture stress during the aJn~cultivating period. Also short duration varieties like Luit, Kapilee (100 - 105 days) can be adopted under this situation.
- ii) Under the same conditions, weeds provide maximum competition in *ahu* crop. Therefore recommended weed control measures should be adopted.
- iii) In case of heavy downpour during the initial *sali* period (July - August), transplanting gets delayed leading to poor crop establishment and yield loss. To make up this loss in late *sali* crop, practices like higher plant population by way of increasing seedling number per hill (6 - 8 numbers) can compensate yield.
- iv) Wet seedling (i.e. showing of pre-germinated seeds in puddled soil) in *sali* rice with early varieties like Luit, Kapilee and Culture - 1 (90 - 95 days duration) are suitable in situations where rainfall is scanty during early vegetative stage. This practice can be followed under very late planting conditions also i.e., upto September 1st week.

The critical factor for adoption gap i.e., 'unavailability of water for crop production' can be substantially reduced by initiating the following practices:

- i) Water harvesting by construction on - farm water storage structures like farm ponds and reservoirs. This will help in collection of excess rain water during kharif season and utilizing it during subsequent rabi and summer seasons.

- ii) Control of surface runoff by adopting proper land grading and shaping. Maintenance of drainage system (natural $\pm$ man made) in field will regulate water supply uniformly.
- iii) Increase in rainwater use efficiency in rabi and summer season by way of utilizing the residual moisture. Application of organic manures in light textured soils and in situ moisture conservation by mulching with weed biomass, paddy straw, etc. increases the residual moisture build up.

It goes without saying that the production strategy will have to be supported by a well-drawn extension strategy. Extension strategy should aim at improving the knowledge base of the farmers specially in soil conservation measures. For this purpose, an easy and authentic communication mechanism is required. It is best to use the service of the village organizations viz., the *Pathar Parichalana Samity*, for affecting desired changes. The procedure to get the work done was suggested below.

- i) Sharing the strategic plan with the ABOs amid VLEWs in Cluster Training followed by preparation of message contents amid delivery plan season wise.
- ii) Organising daylong farmers' trainings in each of the sample villages and in those where similar farming situation existed. These trainings will be organised by the *Pathar Parichalana Samity* and will be imparted by the concerned AEOs and VLEWs. Training monitoring by AAU scientists should be done in specialised areas like soil and water conservation measures.
- iii) Identification of a few enthusiastic members of *Pathar Parichalana Samity* area-wise and impart them intensive training at AAU on farming situation improvement.
- iv) Building capacity of *Pathar Parichalana Samity* primarily to generate fund for procurement and distribution of essential inputs to raise adoption of production recommendations by farmer members.

Conclusion

As per extension plan, the findings of the study and strategic plan so developed were shared with the SMS, AEOs and VLEWs of the two subdivisions. It was noticed that generally dull cluster trainings became so lively that they voluntarily came forward to prepare message contents. Each of the VLEWs also chalked out a plan to hold farmers training in their area of operation. It was finally revealed that the field extension personals actually needed production recommendations specific to farming situations to make their job more meaningful.

The process is going on. However, with the provision of shallow tube-well under World Bank Project farmers in the said farming situation want a change in the crop plan in order to increase water use efficiency. But the facts remain that if the farming specific production recommendations are made available to the farmers, diffusion and adoption of technologies take rapid stride.

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