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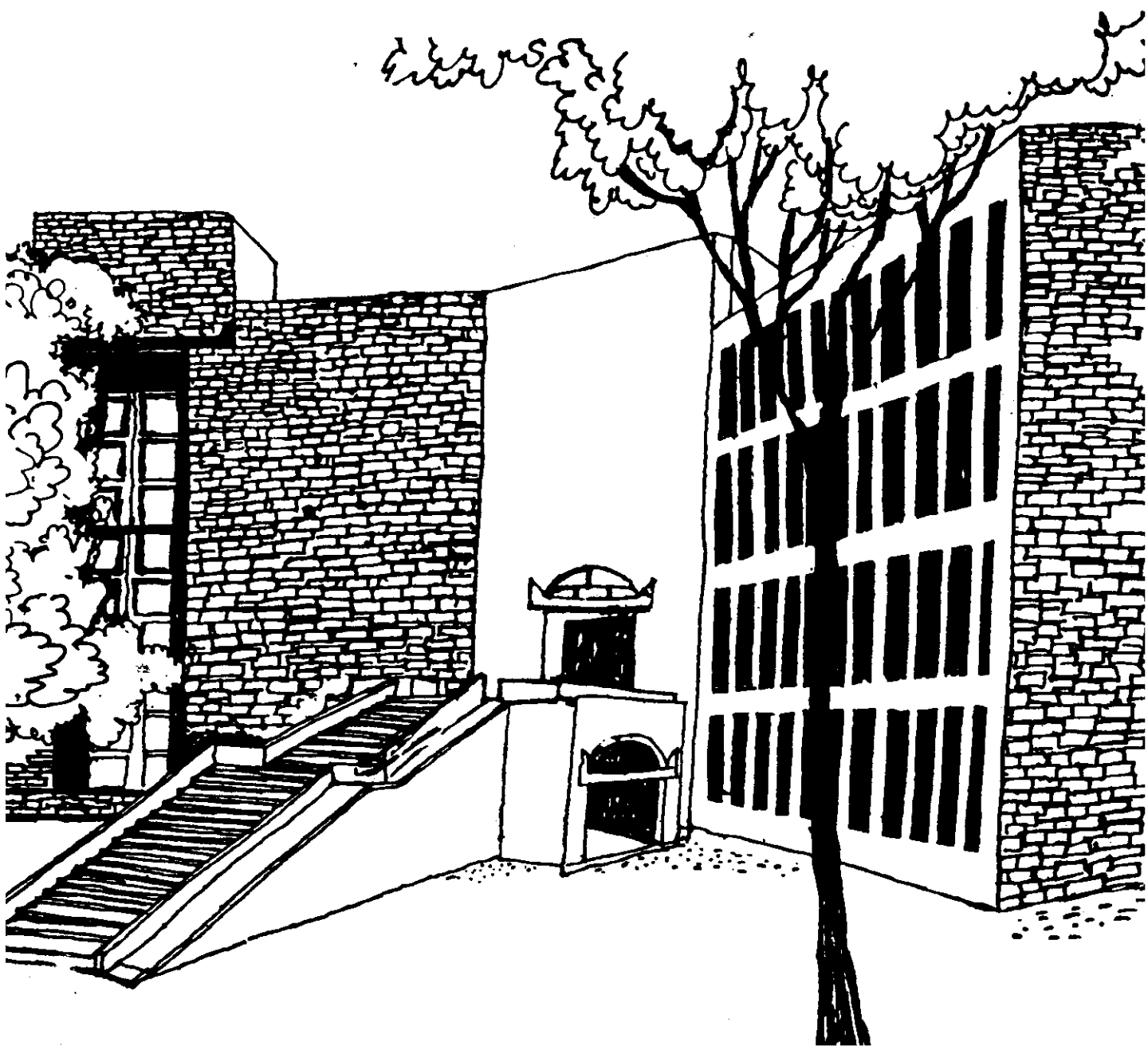

ADJUSTMENT TO RISK IN FARMING - AN ASSESSMENT OF DROUGHT-PRONE FARMERS' STRATEGIES IN KARNATAKA, INDIA

T.M. Gajanana and B.M. Sharma

Abstract

Weather-induced instability in farming in the predominant rainfed lands is fairly well recognised. Faced with the problems of frequent droughts and the resultant risk in farming, farmers in such areas have, by their experience, devised some adjustment strategies to cope with the situations during and after the drought. An attempt is made in this paper to examine the nature and extent of risk in farming and an assessment is made of the adjustment/management mechanism adopted by the farmers in one of the drought-prone districts of Karnataka.

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by

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I. Introduction

Indian agriculture is characterised by the predominance of rainfed lands. Weather-induced instability in farming in such areas is now fairly well recognised. Frequent exposure to natural calamities like drought has made farming in such areas a risky proposition. Faced with the problems of recurrent droughts and the attendant instability in farming, farmers in such areas have, by their experience, evolved certain adjustment strategies to cope with the situations during and after the drought. Risk aversion is natural to be present in such areas resulting in permanent under-investment in agriculture [see Binswanger (1980) and Dillon and Scandizzo (1978)]. An understanding of the nature and extent of instability in farming and the adjustment mechanism adopted by the farmers to insulate against such risk may pave the way for interaction between the scientists and farmers which may in turn result in the development of appropriate technologies to effectively deal with the problems of instability in such areas.

Although number of studies exist on nature and extent of instability in dry farming areas [for example, see Kuchhodia et

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al.(1990), Mruthyunjaya and Sirohi(1979), Nadakarni and Ghosh(1978), Jodha and Purohit(1971), Sen(1967), Gupta(1964), Apte(1964) etc.], the literature on risk adjustment mechanism of the farmers is relatively scarce. The available studies, which are of recent past, have attempted to identify and analyse the effectiveness of various risk adjustment/management devices designed by the farmers. While the focus of attention of certain studies [see, for example, Singh(1982), Singh and singh(1982), and Jodha(1979)] was on risk minimising[1] mixed cropping by farmers, the others [see Gupta(1987), Walker and Jodha(1986), and Jodha (1981b,1981a and 1978)] attempted to study the loss managing [2] mechanism as well.

The risk management/adjustment mechanism of the drought-prone farmers is broadly of three types[3] namely, 1)household adjustment consisting both of intra and inter household adjustments, 2)adjustment at the community level, mainly reliance on common property resources like forests, tank, grazing land etc., and 3)participation in institutional programmes like crop insurance, watershed development and public relief works.

Keeping the above in view, the present study attempts to examine risk, identify the farmers' risk adjustment mechanism and analyse their relevance in policy alternatives for the development of farmers in a typical drought-prone district namely, Tumkur in Karnataka. Sira taluk is one of the worst drought-affected taluks of Tumkur district and during the 80s, 5 out of 8 years(1980-81 to 1987-88) had scanty rainfall and in

1985, the rainfall was as low as 275 mm. against the normal rainfall of 565.8 mm. in the taluk. Data from 130 farmers (29 marginal, 54 small and 47 large)* from ten randomly selected villages of this taluk were used for the study. This paper is organised in four sections. Section II attempts to study the pattern and magnitude of instability in dryland agriculture in the study district. Section III is concerned with the adjustment mechanism against risk adopted by the sample farmers and section IV summarises the findings and suggests policy alternatives.

II. Risk in Dryland Agriculture

As can be seen from Table 1 both CVt and PF indicate that farming in the study area is exposed to risk of a considerably high magnitude characterised by fluctuations in farm returns arising out of variability in both yield and price. Further, it may also be observed that yield fluctuations are more violent than fluctuations in price. Another interesting finding of Table 1 is that from whatever the angle we may look at, be it yield, price or returns, livestock enterprises(dairy)are relatively more stable compared to crop farming. Among crop enterprises, *haraka*(kodo millet), redgram (tur or pigeon pea), *navane*(fox tail millet), and bajra(pearl millet) are more risky than other crops. Even the irrigated paddy appeared to be risky in the study area. It is understandable in that failure of rains affects the irrigated(mostly tank irrigated which in turn depends on rainfall) crops more than the other crops.

Table 1: Ranking of Enterprises based on Coefficient of Variation(CVt) and Probability of Failure(PF)

CVt. of Yields(%)	Enterprises	CVt. of price(%)	Enterprises	CVt. of Returns(%)	Enterprises	PF*	Enterprises
39.53	Haraka	20.65	Horsegram	45.55	Redgram	0.44	Haraka
35.29	Redgram	20.30	Paddy	45.32	Bajra	0.44	Redgram
34.82	Navane	18.97	Bajra	39.53	Haraka+	0.39	Jowar
30.53	Bajra	18.54	Ragi	34.82	Navane+	0.33	Horsegram
29.45	Horsegram	18.06	Jowar	30.48	Paddy	0.28	Navane
29.20	Jowar	17.31	Groundnut	29.68	Groundnut	0.28	Paddy
24.58	Paddy	17.07	Redgram	25.26	Horsegram	0.28	Groundnut
21.81	Korle	8.41	Sericulture	21.35	Ragi	0.22	Ragi
20.11	Sericulture	4.34	Dairy(Cow)	18.74	Jowar		
19.38	Groundnut	3.41	Dairy(Buffalo)	15.59	Sericulture		
19.22	Ragi			10.37	Dairy(Buffalo)		
10.12	Dairy(Buffalo)			8.44	Dairy(Cow)		
6.16	Dairy(Cow)						

*yields were tested for normality using Shapiro -Wilk's W and Geary's 'a' and they were found to follow normal distribution. Yields less than 10 per cent below the normal(mean) yield are treated as failures.
+Due to non-availability of farm harvest prices, price variability was not considered in calculating the return variability.
Source: Gajanana and Sharma(1990)

III. Risk Adjustment Mechanism of the Sample Farmers

Enterprise diversification : Combining subsidiary enterprises like dairy, poultry, sheep rearing and sericulture with crop cultivation is usually practiced by the farmers in drought-prone areas. In addition, off-farm income generating alternatives like labour sale (for wage earning) and business in petty shops are also not uncommon in such areas. As can be seen from Table 2, among the sample farmers, dairy was the most prominent enterprise followed by sericulture and sheep in combination with crop cultivation. Further, adoption of dairy appears to be

Table 2 : Enterprise Diversification by Sample Farmers

(Per cent)

Farmers	Enterprises				
	Dairy	Sheep	Sericulture	Labour	Petty shop
Marginal	48	-	59	24	-
Small	52	17	48	-	11
Large	89	34	53	-	-
Total	65	19	52	5	5

commensurate with the resource position of the farmers with as high as 89 per cent of the large farmers combining dairy with crop cultivation. It may be recalled that in section II we observed that dairy enterprise was relatively more stable compared to crop cultivation. This relatively stable nature of this enterprise appears to have encouraged the farmers to take up dairy in the study area.

Sheep rearing is generally believed to be practiced by small

and marginal farmers so as to generate stable additional income. However, in the study area, this practice appears to have been conditioned by the social status of the households. As was noticed by the authors, sheep rearing was mostly confined to a particular community called 'kurubas'. It is a sheer coincidence that in our study, only large and small farmers(also belonging to 'kuruba' community) were found to have taken up this enterprise.

Sericulture is an enterprise which the sample farmers considered imparting stability to farming besides enhancing the income. Considering the income and employment prospects of this enterprise[5] and the relatively stable price(see Table 1) assured by the well established cocoon markets in the state, the high rate of adoption of this enterprise is not surprising.

Labour sale was prevalent only among the marginal farmers (24%) and these farmers were found to have extended the duration of wage earning from two to four months to tide over the financial difficulties during drought years.

Although Regional Rural Banks(RRBs) advance loans for starting business(petty shops), only a few(11%) small farmers were found to have undertaken this enterprise with crop cultivation. It may be inferred from this that the farmers in the study area are not willing to change from agriculture to a totally different profession like business. This is suggestive of the fact that farmers' association with agriculture is inseparable, be it risky or not profitable at all.

Crop diversification and mixed cropping : Growing a number of crops anticipating yield compensation is one method of minimising the weather-induced risk. In the study area, the sample farmers were found to cultivate 7 to 10 crops* on their farms. Further, mixed cropping was prevalent on these farms. The practice of mixed cropping was found to be more prominent on small sized farms both in terms of proportion of farmers adopting and area devoted to mixed crops [Table 3]. It may be noted that the large farmers also extensively followed mixed cropping and devoted nearly 50 per cent of their land to mixed crops. Further, this practice(as revealed by the respondents) has been in vogue for several years. This is to suggest that the system of mixed cropping has been considered by the farmers of all the size groups to impart stability to weather-induced fluctuations in yields and incomes. This mixed cropping system was found to be mainly groundnut-based consisting of redgram, horsegram, cowpea and/or mungbean(greengram), jowar and bajra. This combination was believed to have ensured food requirements of cereals(bajra and jowar), pulses(redgram, cowpea, horsegram and mungbean), as well as the fodder requirements(jowar and bajra) of the cattle. Groundnut meets the financial needs of the farm family. The underlying logic behind mixed/inter cropping system, besides meeting food, fodder and financial needs of the farm family, is that it improves the soil fertility(leguminous crops like cowpea and greengram fix the atmospheric nitrogen) and prevents pests and disease infestation, and add stability to

farming in the form of yield compensation.

Table 3 : Adoption of Mixed Cropping by Sample Farmers

Farmer Category	Farmers (%)	Area (%)
Marginal	90	69
Small	85	53
Large	83	47
Total	85	50

It is to be noted that barring a few large farmers, the others cultivated redgram(tur) as a mixed crop rather than a sole crop. The farmers' perception about the risk of loss due to large scale pest infestation and their aversion to this risk, and inability to invest in plant protection chemicals(PPC) and sprayers perhaps has encouraged them to adopt a method (inter/mixed cropping) ensuring fairly stable yield and incomes.

Groundnut-based inter crops were mainly of three categories namely, (1)groundnut, redgram, horsegram, cowpea/mungbean, jowar and bajra, hereafter referred to as GM, (2)combination (1) without redgram, hereafter referred to as GHg, and (3)combination (1) without horsegram, hereafter referred to as GT. Details on these combinations are presented in Table 4.

From Table 4 it may be observed that among the groundnut-based mixed crops, GM has the lion's share(50%) while GHg had 33 per cent and GT only 17 per cent. Among the farmers, large farmers(LF) had about 56 per cent of the total mixed cropped area

followed by small(31%) and marginal(13%) farmers. GM appears to

Table 4 : Mixed Crop Combinations on Sample Farms

Farmer Category	GM (%)	GHg (%)	GT (%)	Total (%)
Marginal	55	29	13	100(13)
Small	45	26	29	100(31)
Large	51	38	11	100(56)
Total	50	33	17	100(100)

be the most prominent combination adopted by all the categories of farms. It is interesting to note that GT was less preferred by marginal and large farmers. Risk aversion may be attributed to less area under GT by marginal farmers(MF). However, in case of large farmers, their ability to bear risk and the ability to invest in FPC and sprayers which enabled them to cultivate tur as a sole crop, appeared to have prevented them from allocating more area to this combination. However, small farmers(SF), without growing tur as a sole crop, allotted about 29 per cent of the mixed cropped area to GT. Area under GHg was highest next only to GM in case of MF and LF. But incase of small farmers, it occupied about 26 per cent of the total cropped area.

From the above analysis it may be concluded that the combination GM had the major portion of the mixed cropped area followed by GHg and GT. The rationale behind this may be (as discussed earlier) to achieve the multiple objectives of meeting

the food, fodder and financial needs of the household.

Under-investment as a measure to reduce risk : The fear of loss due to failure of rains and the attendant risk aversion prevents the farmers from investing in farming. For example, the sample farmers were found to invest less in PPC and fertilisers. Paddy crop was sprayed with some chemicals. Large farmers applied Rs.181/ha. worth PPC in paddy fields while small farmers spent RS.95/ha. on PPC. Marginal farmers did not apply any chemicals at all. Further, a negligible amount(Rs.16/ha.) was spent on PPC in case of ragi which received only critical irrigations.

As regards fertilisers, the per hectare application of NPK was only 41 kg in case of MF, 45 kg for SF and 59 kg in case of LF. These doses were only up to 75-80 per cent of the recommended doses. Further, this 75-80 per cent was only in case of irrigated paddy. As regards other crops, the application of fertilisers fell short of the recommended doses by 50 to 80 per cent.

However, it is interesting to note that unlike fertilisers and PPC, the seed rate was distinctly higher (particularly groundnut) than the recommended rate. This may be attributed to the fact that farmers preferred to play safe against the loss due to non-germination of seeds due to moisture stress. Furthermore, it may also be noted that groundnut seed was mostly home produced and thus it did not form part of the paid out costs. This may also be one of the reasons for excessive application of seeds.

However, this aspect needs to be probed further.

Availing credit facilities : Availing credit facilities during drought years so as to maintain their usual level of consumption is very common among the farmers especially the poor, small and marginal farmers. From Table 5 it may be seen that 42 per cent of the sample farmers borrowed from different agencies in 1985 and 33 per cent in 1987, the former being the drought year. Barring the large farmers, the proportion of sample farmers who borrowed was more during drought year. As regards the amount(Rs./borrower) borrowed, it was more(except for marginal farmer), during the

Table 5 : Credit Availed by Sample Farmers

Farmer Category	Borrower (%)	Amount borrowed				
		Agencies(%)				Total (Rs./borrower)
		ML*	CB	RRB	COOP	
Marginal	28(17)	41(38)	16(18)	9(2)	34(37)	6826(8717)
Small	44(32)	54(53)	15(19)	2(4)	29(24)	7184(7014)
Large	47(49)	21(12)	36(45)	-	43(43)	6037(4974)
Total	42(35)	39(34)	23(27)	3(3)	35(35)	6664(6160)

* ML=money lender, CB=commercial bank, RRB=regional rural bank and COOP=cooperative societies.
Note : Figures in parentheses are for 1987.

drought year. In case of marginal farmers, however, since the sample size is very small, the results merit no discussion. In fact, only 5 farmers borrowed in that category in 1987 and 8 in 1985. It is interesting to note that the amount borrowed in case

of large farmers was less compared to small farmers in both the years. This may be attributed to the fact that large farmers borrowed mostly from institutional sources while on the other hand, the small farmers were found to borrow substantially from private sources. It may be noted that the interest rates ranged from 20-24 per cent in case of money lenders against the commercial bank rate of 10-12 per cent and 7-9 per cent in cooperatives. Notwithstanding the high rates of interest, farmers were found to borrow from money lenders/ relatives. Farmers attributed this to timeliness, adequacy, loan without security and simple procedures followed by the private money lenders. Borrowing(mostly from private sources) was found to have added certain amount of stability to the deteriorating consumption levels of small and marginal farmers[9]. It is admitted that the supply side of private credit market could not be analysed for want of time and paucity of funds. Further, the effectiveness of credit in stabilising consumption is beyond the scope of the present paper.

Crop insurance : Crop insurance is relatively new to India. This insurance is not voluntary but is linked to institutional credit. This credit-linked insurance was introduced in the study area for the first time in 1985-86 which incidentally was the drought year in the area. In the year of initiation, the participation rate was somewhat encouraging(42%). But, later on the rate has decreased. The decline was more pronounced on marginal and small

farms. It may be noted that the credit-linked crop insurance was implemented following the area approach*. However, the sample farmers appeared to be suspicious about the beneficial effects of the scheme. They are of the opinion that the scheme may not be of help to them so long it does not reflect the individual farmer's yield. The scheme, however, was withdrawn in 1988. But it was introduced again in 1989. The assessment of the feasibility of the scheme and the examination of this scheme in the context of stabilising the risk-prone farmers' yields was beyond the scope of the present study. However, since the participation rate is low, it is suggested to undertake an in-depth study of financial feasibility and economic viability ~~the re-introduction~~ of the scheme.

Migration, sharecropping, land fallowing and strengthening the irrigated base : Out migration is one way of adjusting to drought-induced risk. In periods of scarcity of green leaves and feed to animals, and also in search of income earning opportunities, drought-affected farmers have a tendency to move out of their villages. Among the sample households only the sheep rearers moved out to different villages(covering a distance ranging from 10 to 80 kilo meters) where in addition to browsing facility for sheep they had income earning opportunities like 'penning' of sheep.

Share cropping, though regarded as one of the most important measures of transferring the risk, it was noticed only on a small

proportion(3%) of the sample households [Table 4]. Share cropping observed in the study area was essentially 'leasing in' by small and marginal farmers from large farmers. Seeds (groundnut) were sometimes supplied to tenants and the tenants used to return the seeds along with the crop share of 50 per cent after the harvest.

Keeping a part of the land fallow, which is subject to vagaries of the monsoon, is another way of minimising the risk by saving on seeds, farm yard manure(FYM), and fertilisers which are likely to be lost in the event of failure of rains. It is also the belief of some sample farmers that keeping land fallow and cultivating it next year would enhance the yield. Twenty eight per cent of the sample farmers, majority being large farmers(36%), kept part(ranging from 0.2 to 4 ha.) of their land fallow [see Table 6]. This practice of land fallowing was less prevalent among small and marginal farmers. This is perhaps due to the pressing subsistence requirements of the farm family from the small size of holdings.

Strengthening the irrigated base is one method of managing the loss due to water scarcity. It was observed that after the occurrence of drought in 1985, 26 per cent of the sample farmers resorted to strengthening their irrigated base either by deepening the wells or having bores in or adjacent to the dug wells [Table 6]. Resource endowment of the large farmers seems to have enabled them to invest in bores. Further, it was observed that 28 per cent of the large farmers took well loans ranging

from Rs.27,000 to Rs.40,000 between 1986-87 and 1987-88. Small and marginal farmers mostly deepened their wells(which are shared by many) by making use of the pooled family labour.

Table 6 : Adoption of Risk Adjustment Strategies by Drought-Affected Sample Farmers

Sl.No. Particulars	Farmer category(%)			
	Marginal	Small	Large	Total
1. Migration	-	17	29	19
2. Sharecropping	7	4	-	3
3. Land fallowing	17	27	36	28
4. Strengthening the irrigated base	17	22	36	26
5. Asset depletion				
i)Land	10	4	-	4
ii)Animals	55	28	-	24
iii)Keeping animals in 'Goshala'	31	19	-	15
6. Reduced consumption	66	52	45	52
7. Adoption of dry farming practices	17	33	36	31

Asset depletion : Asset depletion during drought years and their replenishment after achieving relative stability in consumption is normally followed by drought-affected farmers. From Table 6 it may be seen that 55 per cent of the marginal and 28 per cent of the small farmers resorted to distress sale of animals, mostly bullocks and cows so as to maintain the normal consumption. Fodder crisis in 1985 was one of the reasons for the sale of animals. Realising this fodder crisis, government of Karnataka set up 'Goshala'(cattle camp) in one of the sample villages(Bevinahalli). Unable to feed their cattle, 31 per cent of the marginal farmers kept them in 'Goshala' till the crisis

was over. It was also observed that 6 small and 7 marginal farmers purchased bullocks between 1986-87 and 1987-88 in the process of replenishment of assets.

Reduced consumption : Curtailment of consumption and postponement of current commitments are important methods of managing the loss of assets during and after the drought. As can be seen from Table 6, 52 per cent of the sample farmers resorted to reduced consumption. Marginal and small farmers were the worst sufferers of the drought in 1985 in the study area. Main items of reduced consumption included food, clothing and education of the children. While the large farmers curtailed consumption of non-vegetarian food from 2-3 times a week to once in a fortnight or a month, small and marginal farmers reduced meat consumption from once a week to 2-3 months. Their budget on vegetables from the market got reduced from Rs.10-12 a week to Rs.10-15 once a fortnight. Clothing expenses in that year was cut substantially from around Rs.600 to Rs.400. Children, who were going to the school were withdrawn on account of their inability to pay the fees and also to use them for wage earning on others' farms. However, there were cases of no reduction in consumption among the sample households. These farmers were found to have maintained their consumption by depleting their assets especially the bullocks.

Adoption of dry farming practices : Importance of dry farming

practices is now fairly well recognised. With the establishment of institutes like ICRISAT, CRIDA, etc. a fillip was given to dry farming technologies since the beginning of the seventies. The Agricultural Universities and State Departments of Agriculture are now engaged in research and extension of dryland technologies. In addition to seed centered(HYV) technologies, resource centered(soil and water conservation) technologies like nala bunding, vegetative and rock bunding, gully checks, construction of farm ponds, diversion channels, contour tillage, contour bunding are now developed on research stations and in watersheds. As a result of the extension efforts of Department of Agriculture and Agricultural Universities, a part of the technology package has been transferred to the farmers' fields. In the study area, farmers adopted some of these dry farming practices. As can be seen from Table 6 only 31 per cent of the sample farmers followed one or the other dry farming practices. Adoption of such practices as graded bunds and having farm ponds in their fields was constrained by the small size of holding. Small and marginal farmers adopted practices like contour tillage, contour furrowing and contour sowing. Wooden ploughs predominated the tillage operations in the study area. Barring a few large farmers (who used tractor/bullock operated iron plough), the rest were found to use bullock operated wooden ploughs(which last no longer than a year) to till their land. In order to prevent soil erosion and to conserve moisture, a few farmers resorted to contour bunding also.

The sample farmers were found to have been dependent on common property resources like forests, grazing lands and tanks for meeting fuel, fodder and irrigation water requirements during critical periods. However, active participation in managing these resources was not noticed among the sample farmers.

IV. Summary of Findings and Policy Alternatives.

The preceding discussion centered around the element of risk in dryland farming and the adjustment mechanism adopted by the farmers to insulate themselves against such risks. The analysis of instability with the help of CVt and PF indicated that farming in the study area is a risky proposition. Realising that crop cultivation in such a situation is risky, farmers combined subsidiary enterprises like dairy, sericulture and sheep rearing to some extent. Faced with the frequent droughts and subsequent instability, farmers did evolve certain strategies to cope with such a situation. The adjustment mechanism included both risk minimising and loss managing strategies. Farmers resorted to both intra and inter household adjustments besides participating in communal and institutional arrangements in the process of adjusting to risk due to fluctuations in income arising out of both yield and price variability. However, the results indicated that the pool of adjustment mechanism could not prevent farmers from resorting to drastic measures like depletion of their

valuable assets like livestock and reduced consumption besides migration to other areas in search of feed, fodder and employment opportunities. This is to suggest, though not explicitly, that the strategies adopted by the farmers were far from adequate and were not cost effective.

Mixed cropping predominated the cropping pattern of the farmers. The results indicated a clear rationale behind a particular combination of mixed crops. The combinations (GM/GHg/GT) not only meet the food, fodder and financial needs but also ensure soil fertility through fixation of atmospheric nitrogen by leguminous crops like cowpea and mungbean. The recommended [UAS(1987)] intercropping systems of groundnut and tur(8:2) was not observed on any of the farms. Instead, farmers were found to cultivate more crops than these two so as to meet their multiple objectives. Research efforts may be directed towards profitability and stability aspects of these combinations as well. Any breakthrough in this would directly help the small and marginal farmers who predominate the agricultural scenario.

Small and marginal farmers were found to rely heavily on private sources of credit, even at exorbitant rates of interest, rather than institutional sources. Institutional credit should be made more attractive so as to prevent the farmers from becoming perpetually indebted to the private money lenders. This can be done by introducing flexibility in the credit delivery system. Farmers' limited participation in crop insurance scheme necessitates an in depth study on the feasibility of the scheme

and the reasons for the low participation rate.

Redgram(tur) cultivation, though found profitable on research plots, was not adopted by the small and marginal farmers. Their risk perception of large scale pest and disease infestation prevented them from cultivating tur as a sole crop. This calls for supply of PPC and sprayers at subsidised rates and technical guidance on spraying of chemicals. However, a major technological breakthrough in the development of pest and disease resistant variety alone appears to be feasible on the small sized farms. Research and extension efforts become crucial in such cases.

Dairy and sericulture appear to add some stability to farming. These enterprises need to be encouraged. Linking of feed and fodder sale, and credit with milk marketing by milk cooperatives may ensure large scale adoption of dairying by farmers.

Soils in the study area are affected considerably by salinity and alkalinity. Reclamation of these soils through gypsum application may help the farmers in getting better yields. Soil and water conservation is essential to ensure stability to farming. This is possible by adoption of dry farming practices developed on watersheds. Participation of farmers in watershed development programmes is needed not only to ensure soil and water conservation but also to prevent environmental degradation. Afforestation is required to restore the already beleaguered (hardly 4 % of the area) forest cover.

Notes

1. Diversification, limited dependence on hired resources(under investment/less paid out costs), mixed cropping/farming, increased seed rate, spatially scattered planting, use of sturdy crops, crop insurance etc. are some of the risk minimising strategies. For details, see Walker and Jodha(1986).

2. Linkages of agricultural factor markets, asset depletion/replenishment, labour market participation, inter linked consumption and production, borrowing, reduced consumption, public relief etc. are some of the loss management strategies. For details, see Jodha(1981a), and Walker and Jodha(1986).

3. See Gupta(1988).

4. For details on categorisation of the sample farmers, see Gajanana(1990).

5. See Hanumappa and Erappa(1985)

6. Crops included haraka(kodo millet), navane(foxtail millet), ragi(finger millet), korle(a minor millet), horsegram, tur, mulberry, paddy, groundnut(pure) and groundnut(mixed). Groundnut(mixed) consisted of tur, horsegram, cowpea, mungbean, jowar and bajra.

7. See Improved Cultivation Practices for High Yields(Southern Dry Region), UAS Bangalore(1987).

8. For an excellent account of the role played by credit during drought years in ensuring at least a part of consumption stability, see Jodha(1981b).

9. Taluk is considered to be the homogeneous area for the implementation of crop insurance scheme. The area approach requires the estimates of average yields of the crop over the whole taluk. The crop cutting experiments conducted by the state departments of agriculture serve the purpose. But, the yields so obtained do not necessarily reflect the individual farmer's yield. The reasons for following area approach instead of individual approach are explained in Dandekar(1976 and 1985).

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